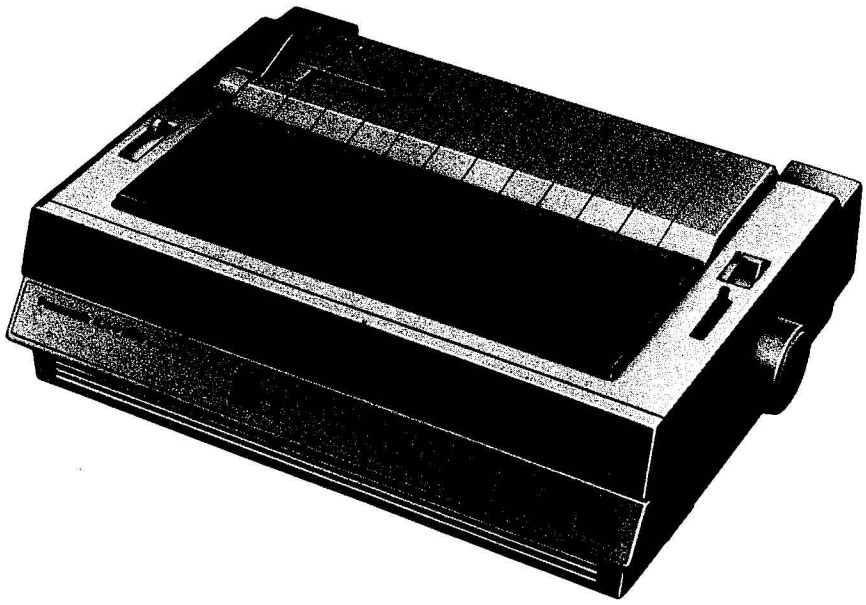
ORDER NO.KM68808223C1
G5

Service Manual

Printer

Dot Matrix Printer

KX-P1180



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1. Specifications

Power requirements: AC120V/60Hz
Current: Idle: 0.2A ; Maximum 0.7A
Print mode: Draft, Sans Serif, Near Letter Quality (Courier, Prestige, Bold PS), Dot Graphics
Character sets: 96 ASCII characters, 96 Italic ASCII characters, 32 International Characters (13 countries), 32 Italic International characters (13 countries). 158 IBM special characters.
Dot configuration: Dot Diameter: 3/254 inch (0.3 mm)

		Draft (PICA)	NLQ
Dot Alignment (H×V)		9 × 9	18 × 18
Dot Pitch	(H)	1/120"	1/240"
	(V)	1/72"	1/144"

Character size
Normal characters: 0.078(W) x 0.095(H) inch (1.99 × 2.42 mm)

Character per line (cpl) (per inch (25.4 mm) (cpi)):

	Draft, NLQ	Elongated
Pica	80 cpl (10cpi)	40 cpl (5cpi)
Elite	96 cpl (12cpi)	48 cpl (6cpi)
Micron	120 cpl (15cpi)	60 cpl (7.5cpi)
Compressed	137 cpl (17cpi)	68 cpl (8.5cpi)
Elite compressed	160 cpl (20cpi)	80 cpl (10cpi)

Print speed:

	Elite	Pica
Draft	192 cps	160 cps
NLQ	38 cps	32 cps

Print direction: Text printing: Bi-directional
Bit image printing: Unidirectional (left to right)
New line time: Approx. 100 msec [with 1/6 inch (4.2 mm) line feeding]

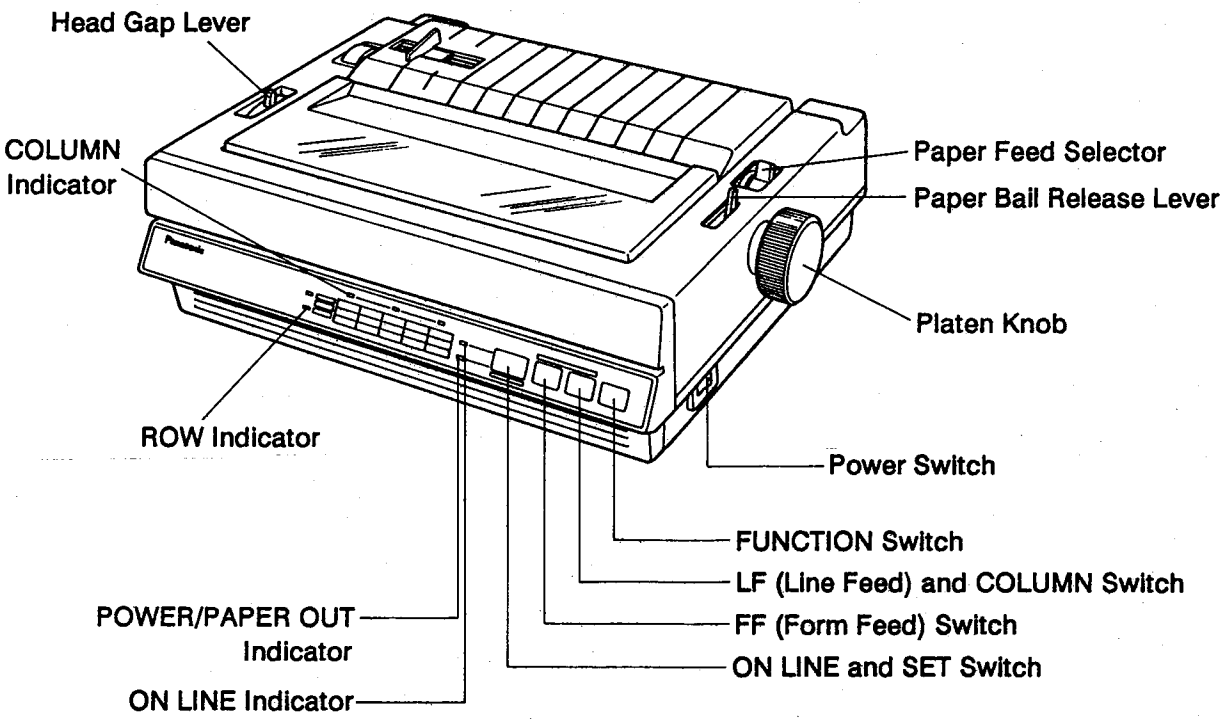
Paper feed: Friction and Tractor
Paper used:

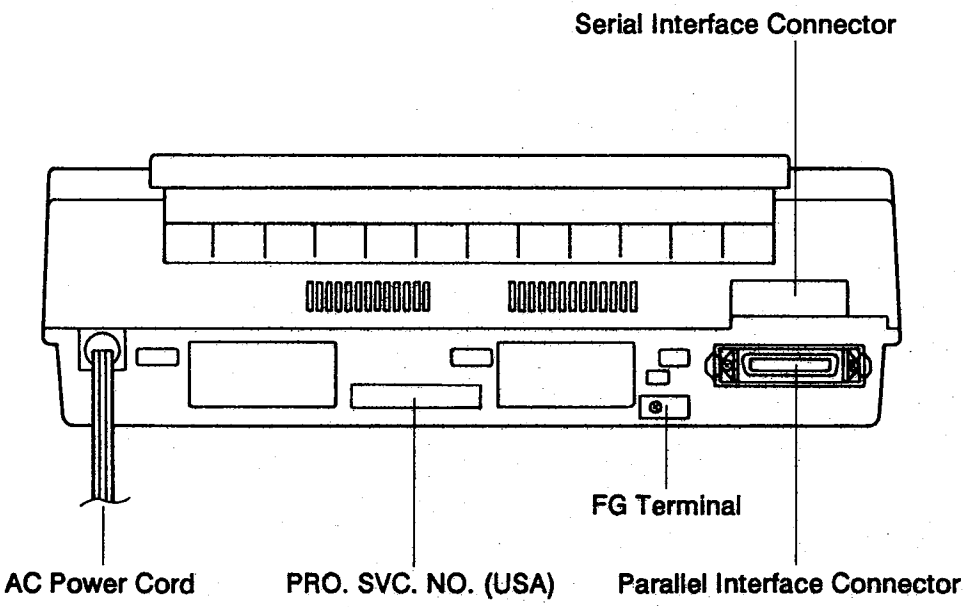
	Width	Weight	Height
Fanfold paper	4-10 in. (102-254mm)	----------	----------
Single sheet	4-11.7 in. (102-297mm)	14-24 lbs.	5-14.3 in. (127-363mm)
Envelopes	Standard business envelope ie: #10 size		

Paper thickness: Total thickness of sheets must be less than 0.013 inch (0.32 mm).
Number of copies: Original plus three non-carbon copies
Storage environment
Temperature: -4°F to 140°F (-20°C to +60°C)
Humidity: 10-90%RH
Operating environment: 50°F to 95°F (+10°C to +35°C)
30-80%RH
Head service life: 100 million character (Draft mode)
Ribbon: Specially designed cassette seamless fabric ribbon
Service life: Approximately 4 million characters (Draft Mode)
Dimensions: 16.7 (W) × 13.4 (D) × 5.2 (H) in. (423 × 341 × 133 mm)
Weight: Approx. 14.1 lbs. (6.4 kg)

Specifications are subject to change without notice.

2. Operator Controls/Indicators

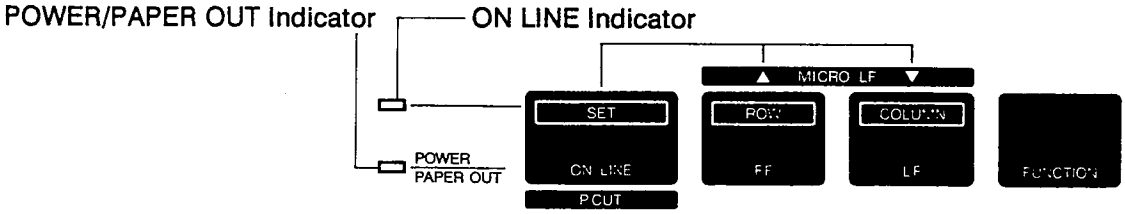




3. Settings of Controls

This section covers the basic operation of the printer. For more detailed operation, refer to the operator's manual.

3.1 Print Mode



FUNCTION switch:	This switch changes printer operation between the print mode and the function mode, as indicated by the ON LINE indicator. When the indicator is lit continuously the print mode is selected, and when the indicator is blinking the function mode is selected.
Line Feed(LF) switch:	This switch advances paper one line at a time.
Form Feed(FF) switch:	This switch advances paper to the top of the next page.
ON LINE switch:	This switch changes the printer operation between on line or off line, as indicated by the ON LINE indicator. When the indicator is lit continuously, the printer is on line.

3.1.1 Micro Line Feed

Micro Line Feed is used to move the paper in increments of 1/216 inch. It is performed by holding the ON LINE switch actuated and simultaneously pressing the LF or FF switch. In this mode, the LF switch backs up the paper, and the FF switch advances the paper.

3.1.2 Self Test Print

Self test is accessed by holding the LF switch actuated when turning on the power switch. First, the ASCII characters of the internal fonts are printed. Next, DRAFT print continues for 1000 lines of printing. To exit self test, turn off the power switch.

3.1.3 Hex Dump Print

Hex dump is accessed by holding the LF and FF switches actuated when turning on the power switch. Data received from the computer is printed in hexadecimal form. To exit hex dump, turn off the power switch.

3.2 Function Mode

The function mode is selected by pressing the FUNCTION switch. The ON LINE indicator blinks when in the function mode. When the function is selected, the SET switch enters the function. The COLUMN indicator blinks to show the position of the function, and when SET is pressed, the column indicator lights continuously. The following functions are selected by using the ROW and COLUMN switches.

3.2.1 Function Chart

FUNCTION	ROW	COLUMN				
		ON ▨ ▨	ON ON ▨	▨ ON ▨	▨ ON ON	▨ ▨ ON
FONT	ON ▨	PGM (Program)	DRAFT	COURIER	PRESTIGE	BOLD PS
PITCH	ON ON	PGM (Program)	10cpi (Pitch)	12cpi (Pitch)	17cpi (Pitch)	PS
OTHERS	▨ ON	QUIET	11" (Form Length)	12" (Form Length)	14" (Form Length)	8.5" (Form Length)

Note:
- PGM (Program) overrides software commands sent to the printer.
- The quiet mode can only be set (COLUMN Indicator is lit) and released (blinking) by repeatedly pressing the SET switch.

3.2.2 Paper Cut

The SET switch in Function mode allows tearing continuous paper off at the perforation. When pressed once, the paper advances above the plastic cover for easy paper separation. If SET or FUNCTION switch is then pressed, the paper moves back to the previous position.

3.2.3 Memo Load

The memo load function enables printing on single sheets of paper or envelopes without removing continuous paper. The operating procedure is explained below:

1. Tear off the continuous paper at the perforation.
2. Press the FUNCTION switch and the ON LINE indicator starts blinking.
3. Pull the bail lever switch. The carriage moves to the center of the platen, and continuous paper automatically moves back to the tractor feeder. Next the ON LINE indicator stops blinking.
4. Position the paper feed selector to "F".
5. Load a single sheet of paper or envelope by pulling the bail lever and then press the FUNCTION switch.
6. After printing is completed, press the FF switch to remove the paper, and then reposition the paper feed selector to "T".
7. Pull the bail lever. The continuous paper returns to the printing line.

Note: Memo load only functions correctly when the paper is fed by push feed in the "T" position.

3.3 DIP Switch Setting

Turn the power off before setting the DIP switch. The DIP switch is located on inside of the printer front, and functions are in the chart below.

SWITCH NUMBER	FUNCTION	ON	OFF
SW1	Printer Mode	IBM (Proprinter II)	Standard (FX-86e/FX-800)
SW2	Skip Perforation	1 inch (25.4mm) skip	No Skip
SW3	Auto LF	CR + LF	CR only
SW4	Cut Sheet Feeder (Option)	Installed	Not Installed
SW5	7/8 bit	7 bit	8 bit
SW6 SW7 SW8	Character Set	SW1 = ON: See Chart 1 SW1 = OFF: See Chart 2	

Chart 2 : International Character Set

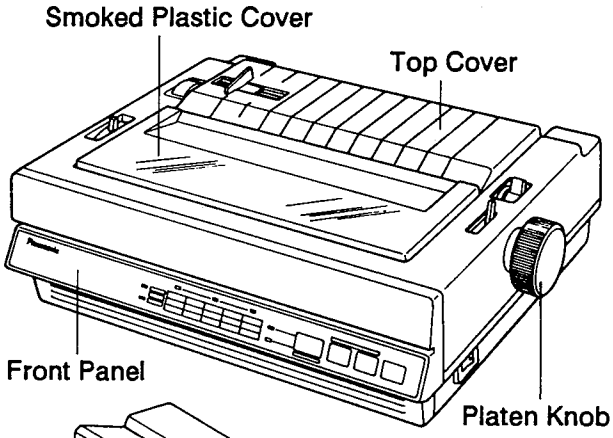
SW6	SW7	SW8	INTERNATIONAL CHARACTER SET
OFF	OFF	OFF	USA
ON	OFF	OFF	FRANCE
OFF	ON	OFF	GERMANY
ON	ON	OFF	ENGLAND
OFF	OFF	ON	DENMARK I
ON	OFF	ON	SWEDEN
OFF	ON	ON	ITALY
ON	ON	ON	SPAIN I

Chart 1: (IBM Proprinter II Emulation mode)

SWITCH NUMBER	FUNCTION	ON	OFF
SW6	Character set	Set 2	Set 1
SW7	Automatic CR	Causes Auto CR	Prevents Auto CR
SW8	Zero font	Zero slash ø	Zero 0

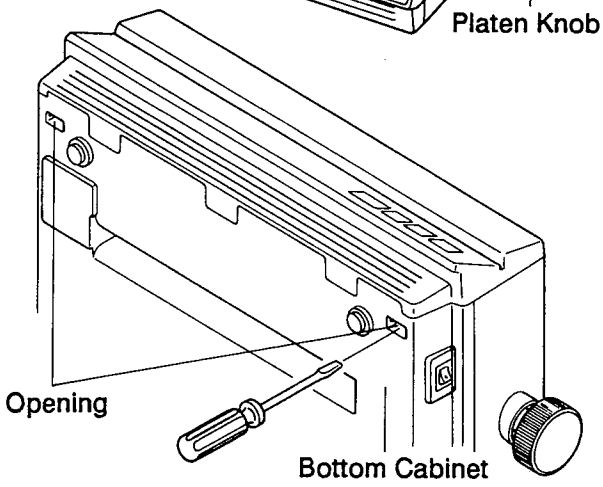
4. Removal and Replacement Procedures

For safety and to avoid possible damage to electronic components, the AC line cord must be unplugged before disassembly.



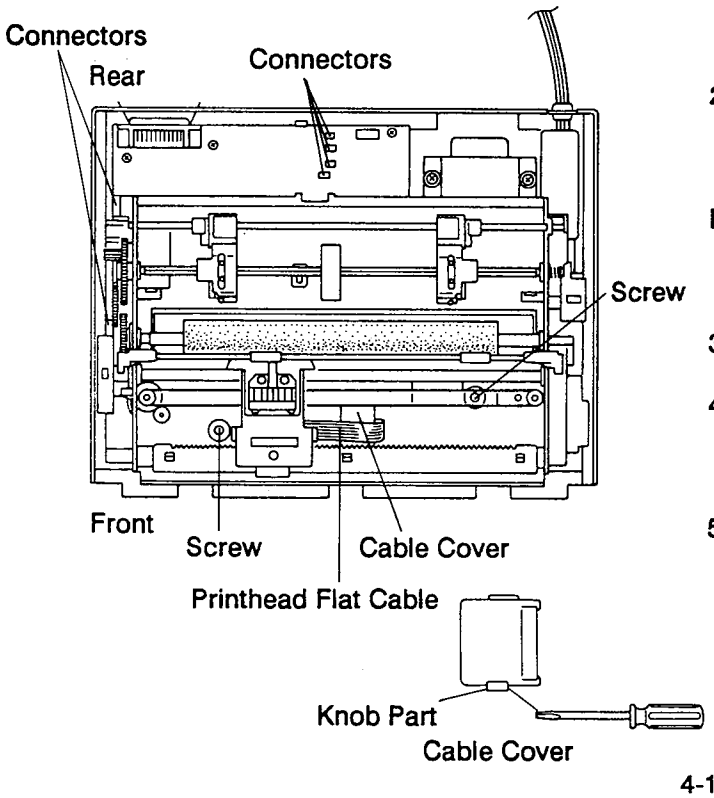
4.1 Covers

1. Remove the smoked plastic cover and the top cover.
2. Remove the platen knob.



3. Remove the upper cabinet by following procedure.
4. Raise the unit and insert a screwdriver into the bottom openings. Pry the screwdriver to release the hooks, and then separate the upper cabinet from the bottom cabinet.
5. Remove the front panel by releasing the connector cable.

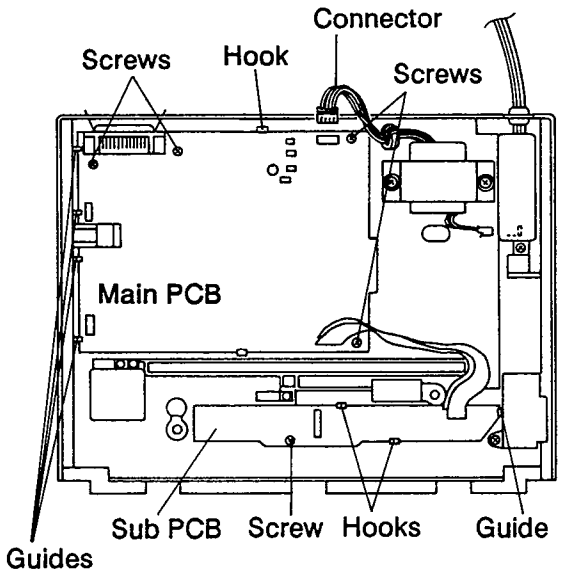
4.2 Printing Mechanism



1. Unplug the sensor connectors (CN5, CN6, CN7, CN8, CN9).
2. Position the carriage on left side and unplug the print head flat cable from the connector by removing the cable cover.

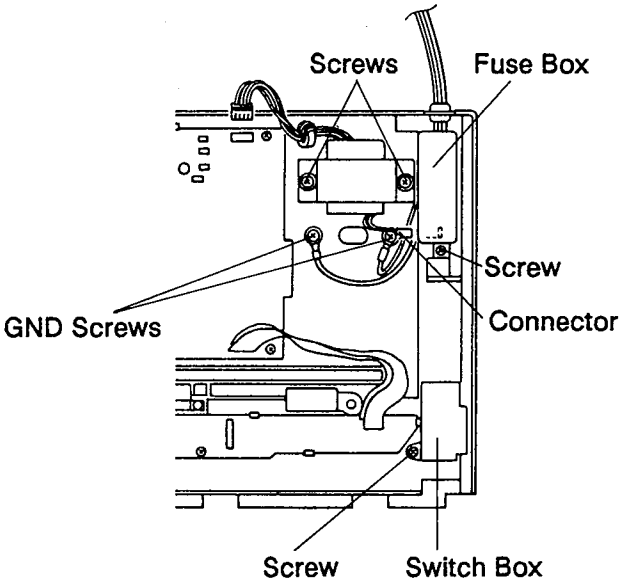
Note: To remove the cable, first pry the cable cover off with a screwdriver. Be careful not to damage the cable.

3. Remove the screws (2) from the chassis.
4. Raise the front of the chassis and release the chassis rear hook then unplug the motor connectors (CN10, CN11).
5. Lift off the printing mechanism.



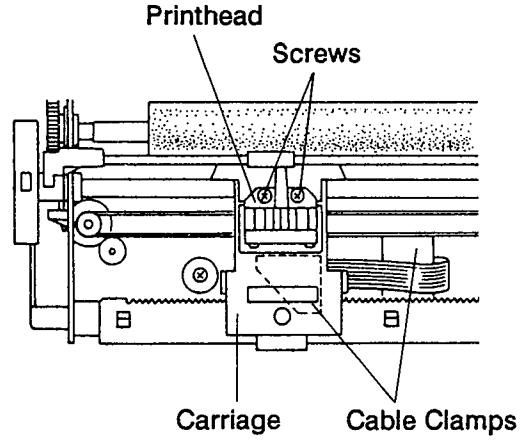
4.3 Main Board

1. Unplug the connector (CN1) on main PCB.
2. Remove the screw on sub PCB and remove the sub PCB by releasing 2 hooks.
3. Remove the screws (4) from the main PCB.
4. Release the hook with little raising the main PCB end at transformer side and little slide the main PCB to transformer side then remove the main PCB.



4.4 Power Transformer and Power Supply

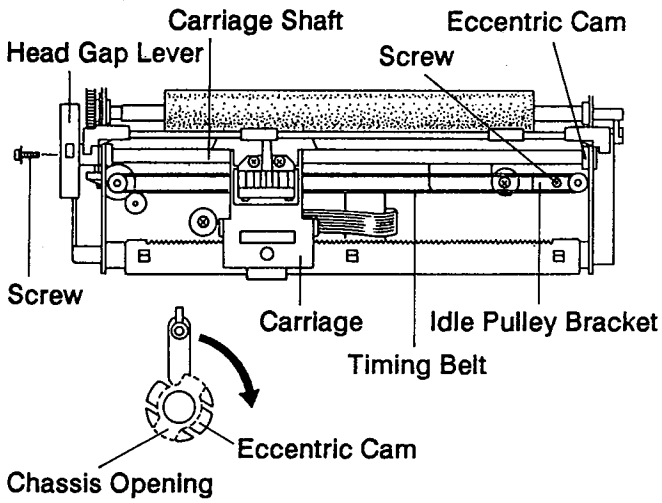
1. Unplug the connector (CN501) from the primary power PCB.
2. Remove the screws (2) from the power transformer.
3. Remove the screws from fuse box and power switch box and remove the GND wires screw (2).
4. Lift off the AC cord clamp and remove fuse box with power switch box.



4.5 Printhead

1. Remove the 2 screws from the printhead.
2. Carefully raise the printhead and unplug the flat cable.
3. Remove the clamps on the carriage and chassis and unplug the flat cable.

Note: When the printhead is installed, ensure that the head gap is correct.

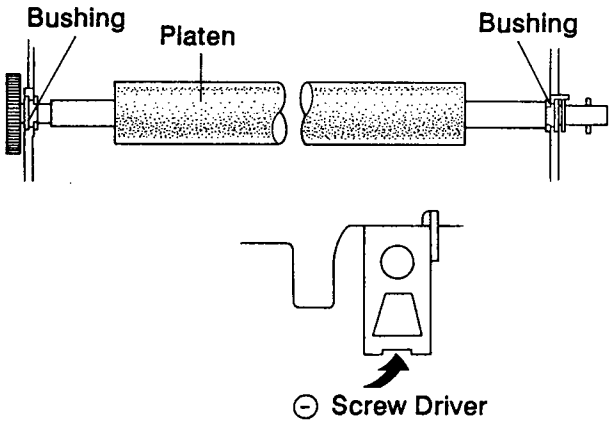


4.6 Carriage Assembly

1. Loosen the idle pulley bracket screw and release the timing belt from the pulley.
2. Remove the head gap lever screw, and then remove head gap lever.
3. Remove the eccentric cam placed the head gap lever side from chassis opening by turning either clockwise or counter clockwise.
4. Slide out the carriage shaft and remove the carriage assembly.

Note: When the carriage shaft and its shaft is installed, ensure that the head gap is correct.

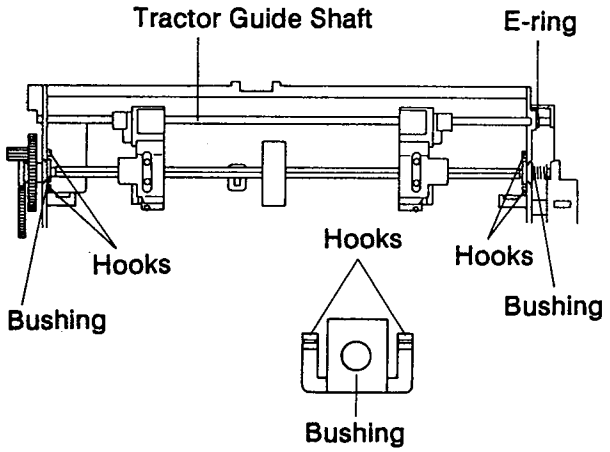
When installing the carriage shaft, ensure the GND spring contacts under pressure on surface of the carriage shaft.



4.7 Platen Assembly

1. Unlatch the platen assembly bushing on both side by prying with a ⊖ screw driver.
2. Lift off the platen assembly.

Note: Keep the platen assembly on a safe place to avoid dent on rubber.
When installing the platen assembly, ensure that the GND spring contacts under pressure on surface of the platen shaft.

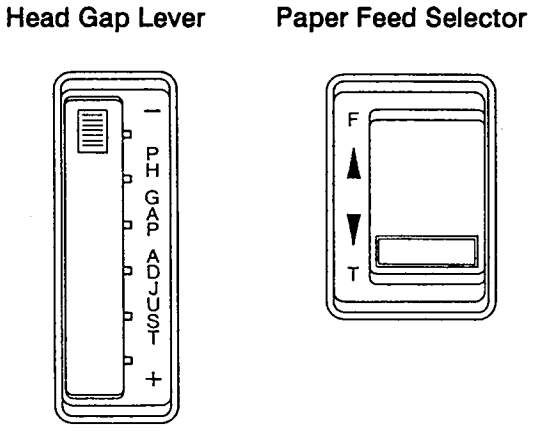


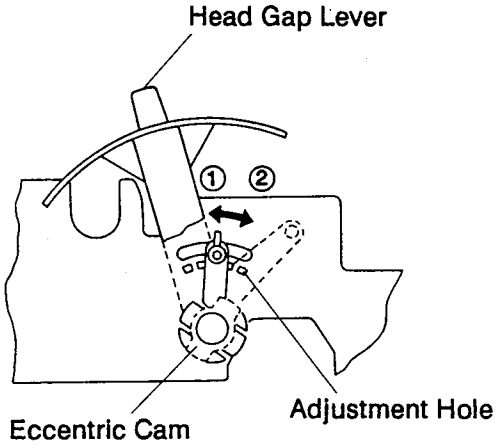
4.8 Tractor Assembly

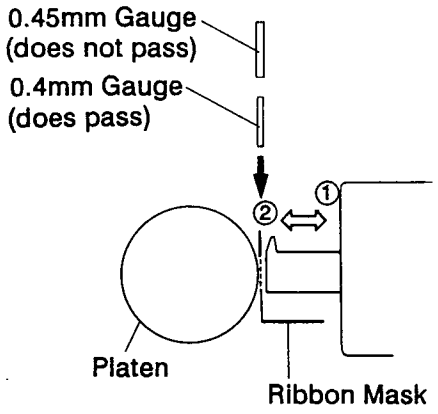
1. Release the tractor guide shaft E-ring and slide out the shaft.
2. Unlatch the hooks and then release the bushing on both side.
3. Lift off the tractor assembly.

5. Adjustment

5.1 Head Gap







1. Set the head gap lever to the single sheet position.

2. Set the paper feed selector to the "T" position.

3. Ensure the printhead is firmly secured with 2 screws.

4. Move the carriage to the print start position on the platen, and adjust the head gap between the platen and the printhead for a clearance of 0.4mm – 0.45mm by turning the left eccentric cam.

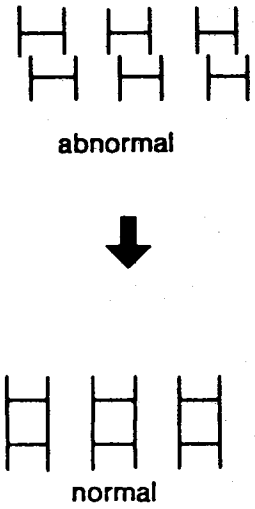
   Moving the head gap lever towards the ① position increases the head gap clearance, and moving toward the ② position decreases the clearance.

5. Move the carriage to the print end position on the platen, and adjust the gap as per step 4 above by turning the right eccentric cam.

Note: The projection on the eccentric cam is released from the adjustment hole by pulling the knob. Turning the eccentric cam one step causes 0.035mm head movement. The eccentric cam can also be released from the adjustment hole through an opening on the inside of the chassis. Use a pin point object to release the eccentric cam without removing the upper cabinet.

Note: Use only a round wire feeler gauge of the specified dimension for this adjustment.

Note: The head gap adjustment is required when replacing the head, platen, carriage, carriage shaft and eccentric cams.



5.2 Print Timing

This adjustment is used for print timing and it is adjusted using the following procedure:

1. Turn on the power switch while holding the Function switch actuated.

2. Check the print timings comparing the "H" pattern from line to line.

Note: This adjustment can select eight different printing speeds. When entering this mode, "Speed 1" (Draft Print) is automatically selected as the standard speed for all modes. Pressing the ON LINE switch, steps through the other seven speeds. If one print speed is more frequently used, select the proper speed by pressing the ON LINE switch.

3. If the print timing is misaligned, adjust it by turning the VR1.

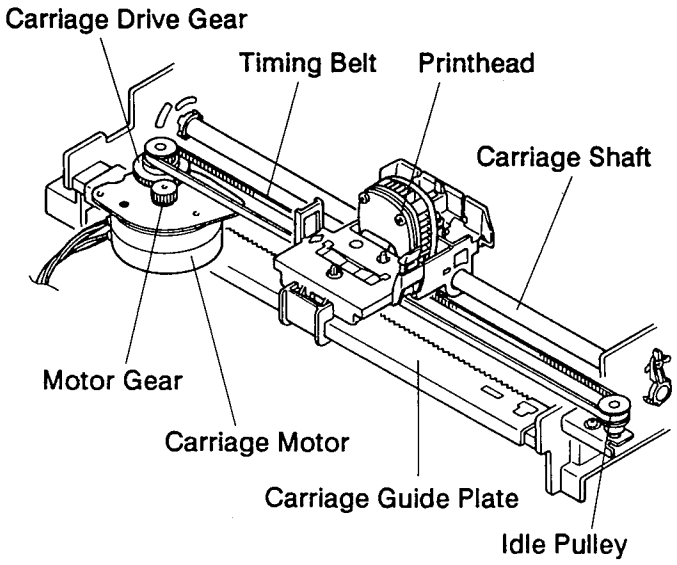
Note: The value of the variable resistor is printed out in Hex. code in the line of "H" characters. Use this Hex code for reference when performing this adjustment.

Note: If the second line of the "H" pattern is shifted by more than half of an "H" character, check the printing mechanism is normal before starting adjustment.

SPEED		COLUMN			REPRSENT PRINT MODE
High	1	ON	OFF	OFF	Draft 10,12cpi
	2	OFF	ON	OFF	Image 72dpi
	3	ON	ON	OFF	Image 80dpi
	4	OFF	OFF	ON	Draft 15cpi, Image 90dpi
	5	ON	OFF	ON	Draft 17,20cpi, NLQ 10,12cpi
	6	OFF	ON	ON	Image 144 dpi
	7	ON	ON	ON	NLQ 15cpi
Low	8	OFF	OFF	OFF	Double high, NLQ 17,20cpi

6. Mechanical Function

6.1 Carriage Drive System



This operation uses a pulse motor to move the carriage 1/60 inch per single drive pulse. The carriage slides on the carriage guide plate and carriage shaft when spacing to the right and left. The printhead is fixed on the carriage by 2 screws.

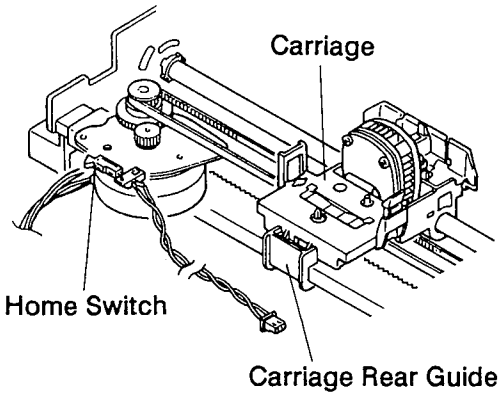
6.1.1 Power Transmission Mechanism

The rotation of the carriage motor is transmitted to the carriage through the carriage drive gear via the motor gear which is attached to the carriage motor. The timing belt fixed under the carriage is looped around the idle pulley and carriage drive gear. This causes the carriage to move left and right along the carriage shaft. Also, the timing belt is given proper tension by the idle pulley tension spring hooked between pulley bracket and chassis.

6.1.2 Print Timing

Print timing for pica (1/60 inch) and elite (1/72 inch) is generated by a software operated timer. Refer to "Carriage Motor Drive Block" page 8-10.

6.1.3 Home Position Detector Mechanism



The home switch is a leaf switch located at the far left of the printer. Its function is to notify the CPU of the reference position of the carriage. During spacing operation, when the carriage approaches the left margin, the carriage rear guide, mounted on rear of the carriage, actuates the home switch, generating the signal and indicating carriage position to the CPU.

6.1.4 Ink Ribbon Cassette Drive Mechanism

This function performs the ribbon feed operation in accordance with the movement of the carriage. The ink ribbon cassette drive mechanism is shown in Figures 1 and 2.
This mechanism gives uniform ribbon feed regardless of the direction of the carriage movement. It consists of the rack gear Ⓕ, ribbon drive gear Ⓔ with the ribbon feed hub and 3 gears.

When the carriage moves to the right (Fig.1), rack gear Ⓕ turns the neutral gear Ⓐ counter-clockwise, and then neutral gear Ⓐ engages with gear Ⓓ via the gear Ⓒ which turns the ribbon drive gear Ⓔ clockwise with the hub.

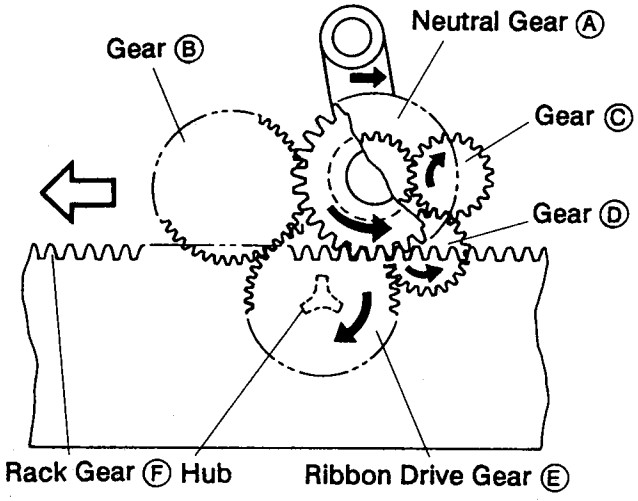


Fig.1 (Bottom View)

When the carriage moves to the left (Fig.2), rack gear Ⓕ turns neutral gear Ⓐ clockwise, and then neutral gear Ⓐ engages with gear Ⓑ which turns ribbon drive gear Ⓔ clockwise with the hub.

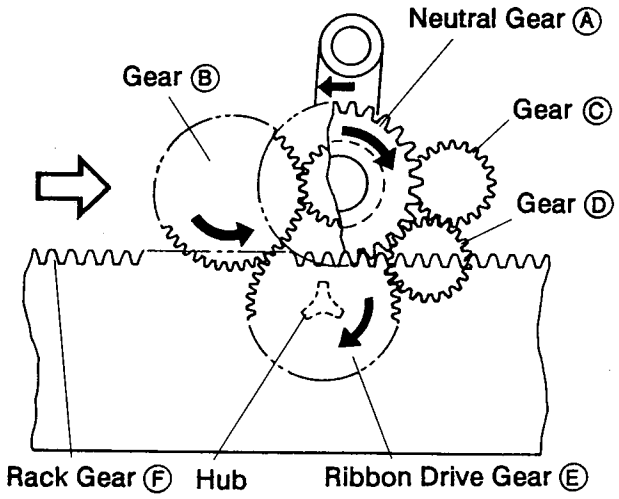
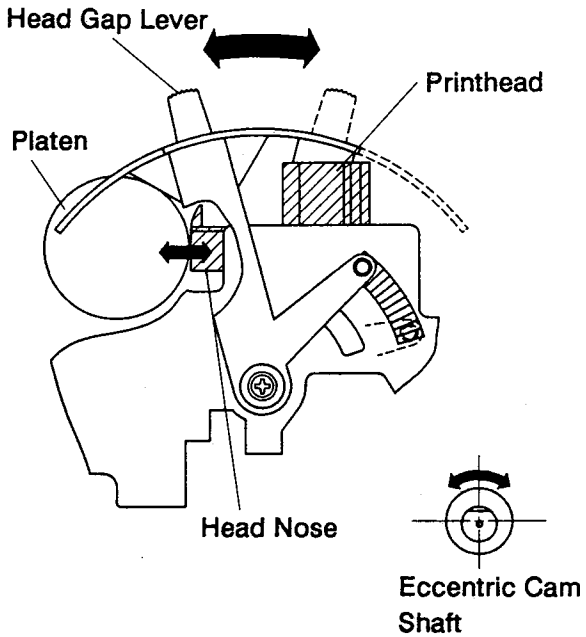
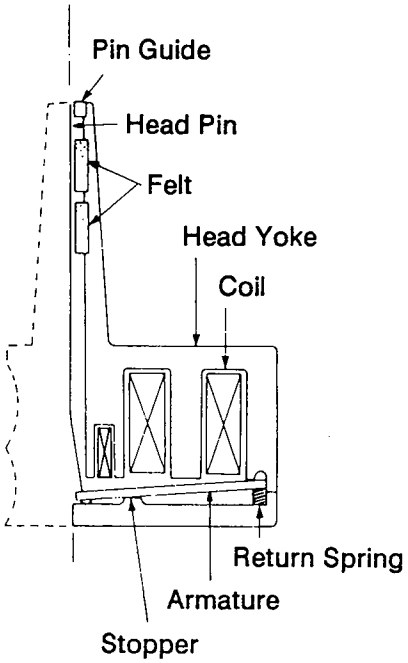


Fig.2 (Bottom View)

6.2 Paper Thickness Selection

Selection for the number of copies is made by changing the distance between the platen and the printhead nose tip. When the head gap lever is operated, the eccentric cam shaft revolves, moving the carriage forward or backward.





6.3 Printhead

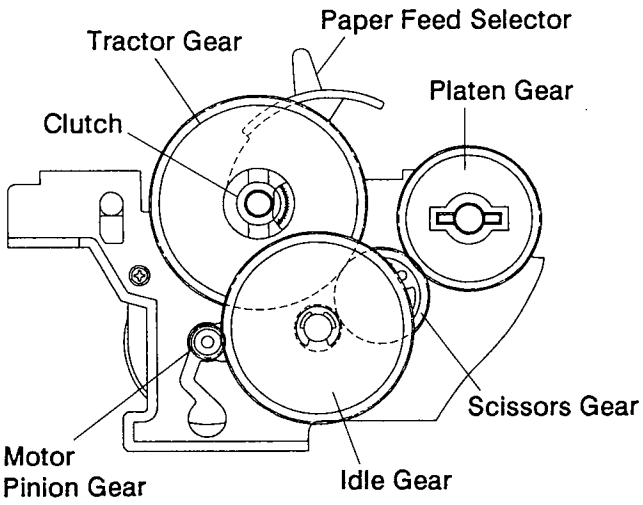
The printhead utilizes 9 electromagnets as a driving source, which causes the pins to strike through the ink ribbon against the platen onto the typing paper for matrix printing. The construction of the printhead is shown at left.

6.3.1 Power Transmission Mechanism

The set of 9 electromagnets consists of a one piece yoke and 9 coils. The armature which secures the pins is supported by this yoke.

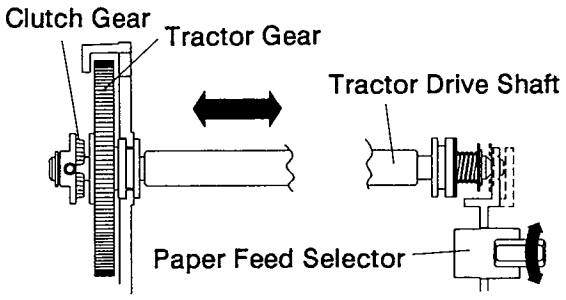
6.3.2 Printhead Pin Operation

When a coil assembly is excited by a print signal, the armature is drawn in, and the pin secured by the armature is guided by the various guides to move in the direction of the platen. The pin strikes through the ribbon to the paper. Next, the return spring moves the armature and pin from the platen back to the rest position.



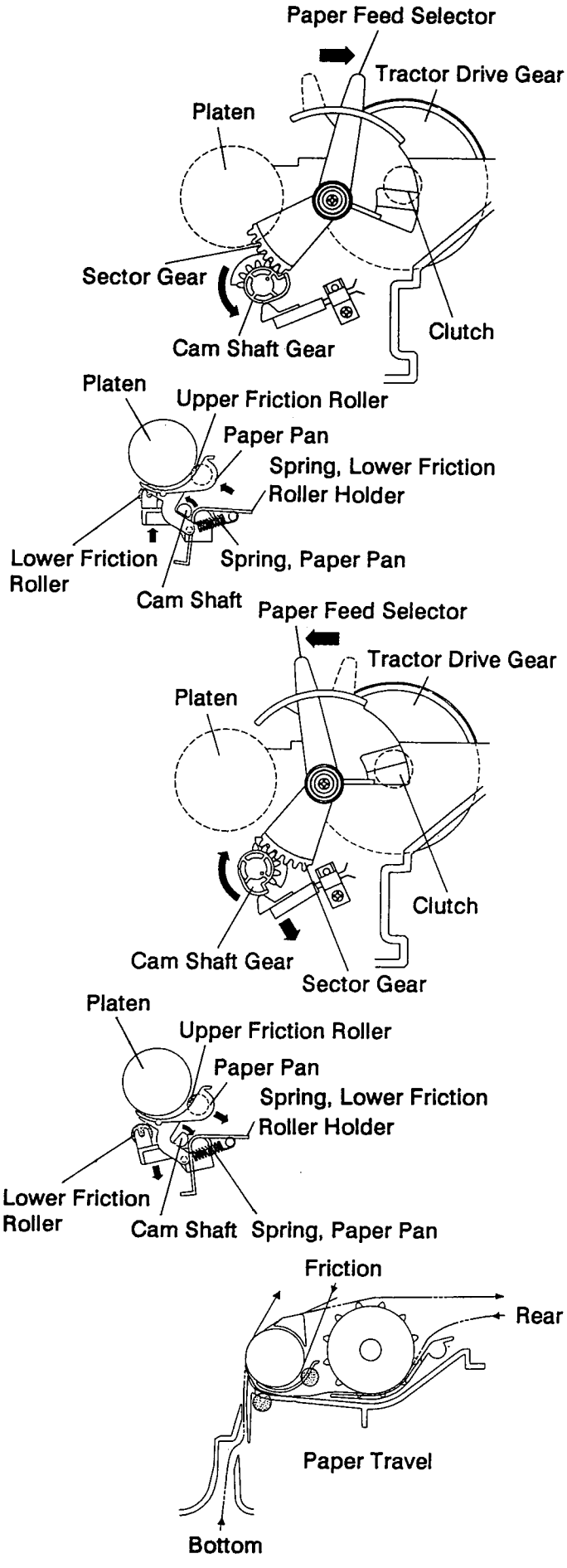
6.4 Paper Feed Mechanism

A DC pulse motor is used for paper feed. Both continuous paper and single sheet can be fed by operating the paper feed selector. Continuous paper is loaded on both the left and right sides of the pin drum of the tractor drive device. Continuous paper is fed from the bottom or rear of the printer. Single sheet paper is fed from upper slot on top of the printer. The paper feed mechanism is shown below.



6.4.1 Power Transmission Mechanism

Rotation is transmitted from the pulse motor to the platen gear and tractor gear via the idle and scissors gears. The tractor gear consists of a drive gear and clutch mechanism which functions when operating the paper feed selector. The selector lever pushes end of the tractor shaft to disengage the tractor drive device from the tractor gear, and then releases the spring loaded friction rollers by rotating the cam shaft to apply the gripping force for single paper feed. The tractor drive mechanism consists of a pin drum with a spring loaded a paper hold cover and its drive shaft to feed continuous paper.



6.4.2 Paper Feed Mode

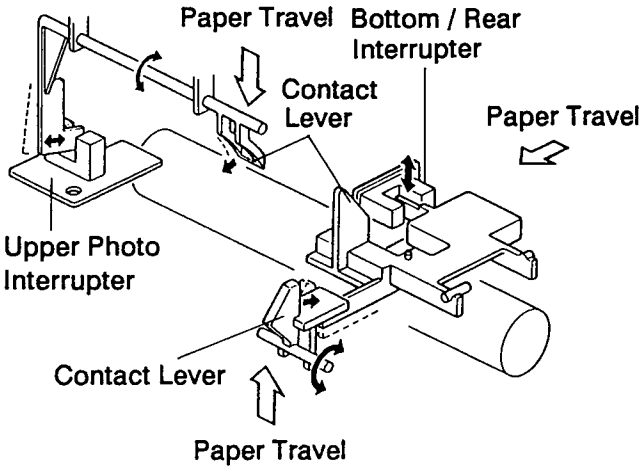
(1) Friction Paper Feed Mode

This mode is for feeding single-sheet paper from the slot on top of the printer in the friction paper feed position. By operating the paper feed selector, the tractor drive gear is disengaged from the tractor drive device, and the paper feed selector lever releases the spring loaded upper and lower friction rollers by rotating the cam shaft to apply gripping force to the platen. This enables paper feeding with platen rotation.

(2) Tractor Paper Feed Mode

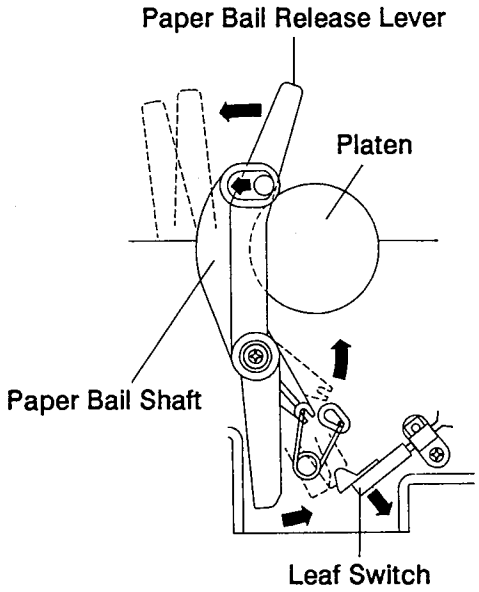
This mode is for feeding continuous paper from either the bottom or rear of the printer. By moving the paper feed selector to the "T" position, the tractor drive gear is engaged with tractor drive shaft by cam function, which enables turning the tractor drive mechanism. Then the sector gear molded on the paper feed selector turns the cam shaft, which moves the upper and lower friction rollers away from the platen to enable free paper passing from the rear feed. The paper feed selector also pushes the leaf switch to notify the CPU that the selector is in the "T" position when turning the lever.
Continuous paper can be fed with either pull or push feed. Feed from the tractor upper side enables pull feed, and feed from the tractor lower side enables push feed.

6.5 End of Paper Detectors



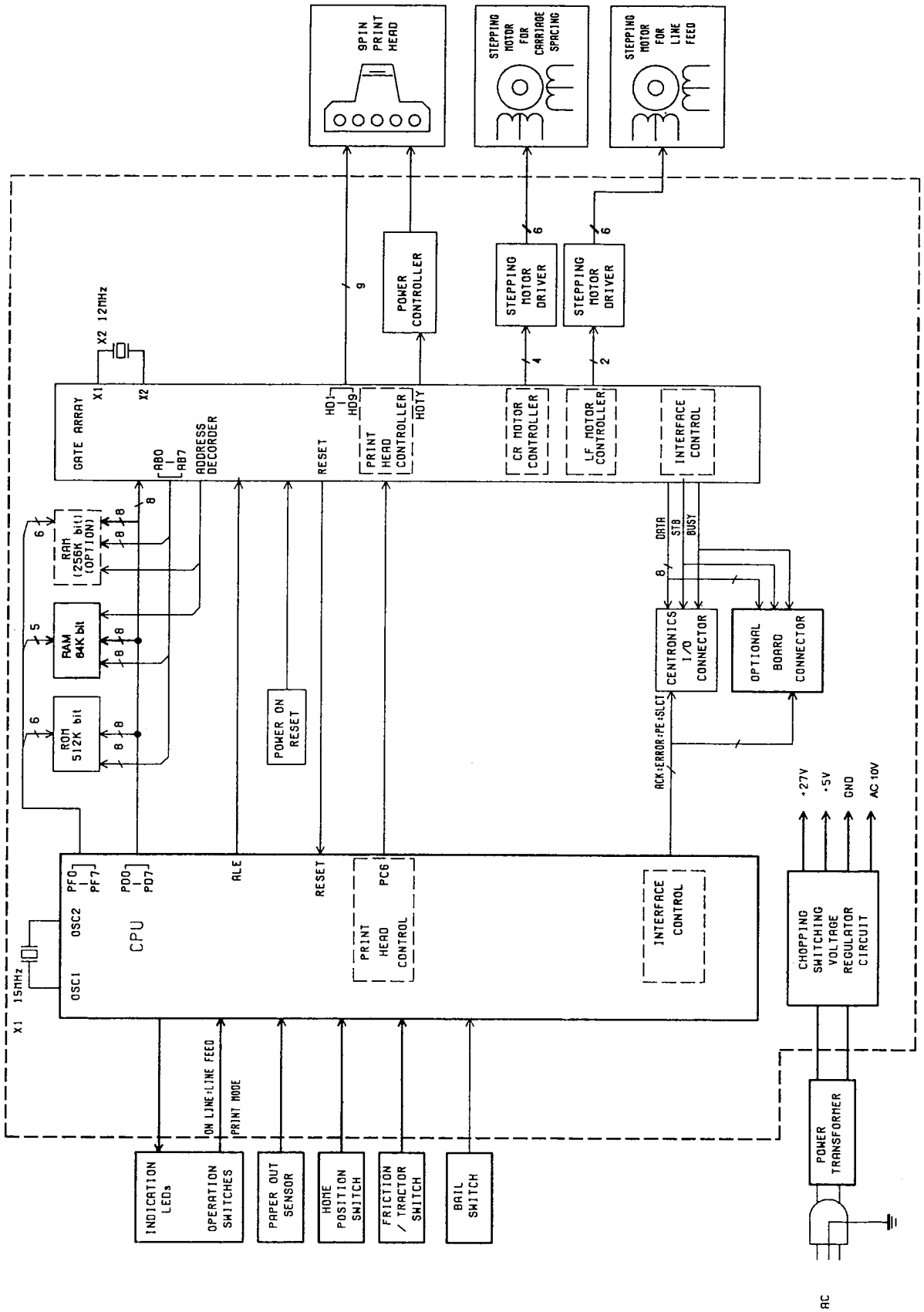
The printer has two photo interrupters used for detecting paper out in continuous or a single paper feed. The upper photo interrupter is mounted under the upper slot. The bottom and rear photo interrupters are mounted under the tractor drive mechanism, and those contact levers are respectively placed in the upper slot, in the bottom slot and under the tractor pin wheel. When paper is out, the contact lever shuts off the photo switch by breaking the light beam, and a signal is sent to the CPU.

6.6 Paper Load



Pulling the paper bail release lever forward moves the paper bail away from the platen. Continued forward movement of its lever causes the leaf switch to be actuated for paper auto loading and memoload.

7. Electronic Circuit Block Diagram

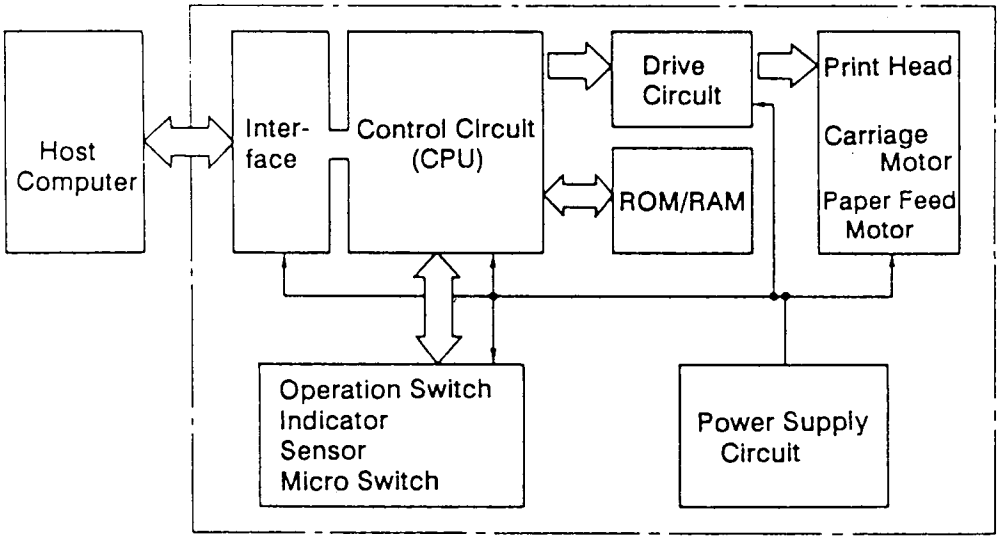


8. Electronic Circuit Descriptions

8.1 Principle of Operation

The KX-P1180 has three switches and two sensors. The home position switch sets a reference for the carriage and is necessary for aligning the first print position. The Friction/Tractor switch detects the way of paper-feed by Friction or Tractor. The Bail Lever Switch is actuated for paper auto loading and memoload. The paper out sensors detect paper end, and prevent printing operation when the printer is out of paper. The printer has three drive circuits; carriage spacing motor, paper feed motor and printhead. The control panel is composed of switches and LEDs which indicate the various states of the printer.

Logic Diagram

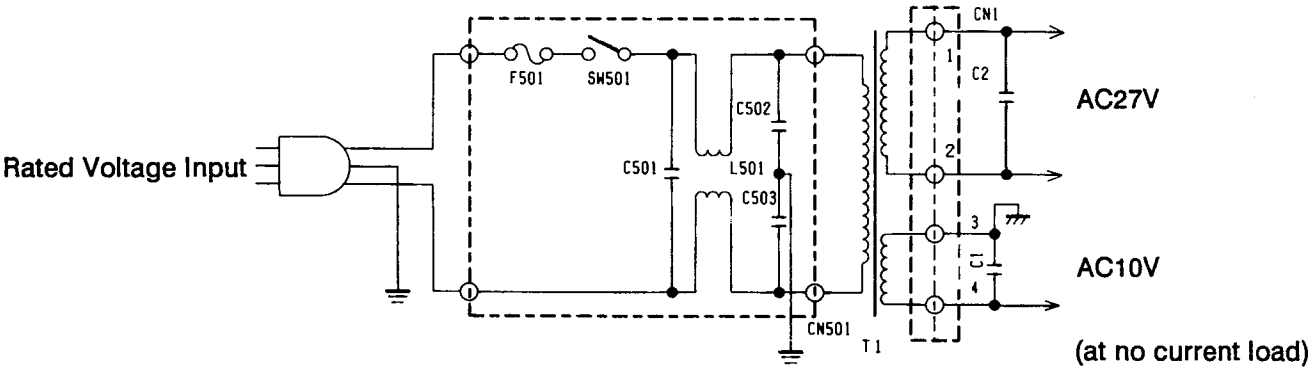


8.2 Circuitry

8.2.1 Power Supply Block

(1) Power and Filter Block

The fuse and filters are attached to a single printed circuit board. Primary power enters the power switch and passes through fuse F501(1.6A). Absorption capacitors (C501, C502 and C503) together with choke(L501), located near the primary transformer, prevent noise from entering the circuit from the power source, and prevent noise from leaving the printer to the power source. As a result, the printer's digital circuitry operates very stably, unaffected by line noise, and prevents printer noise from affecting the outside power source.

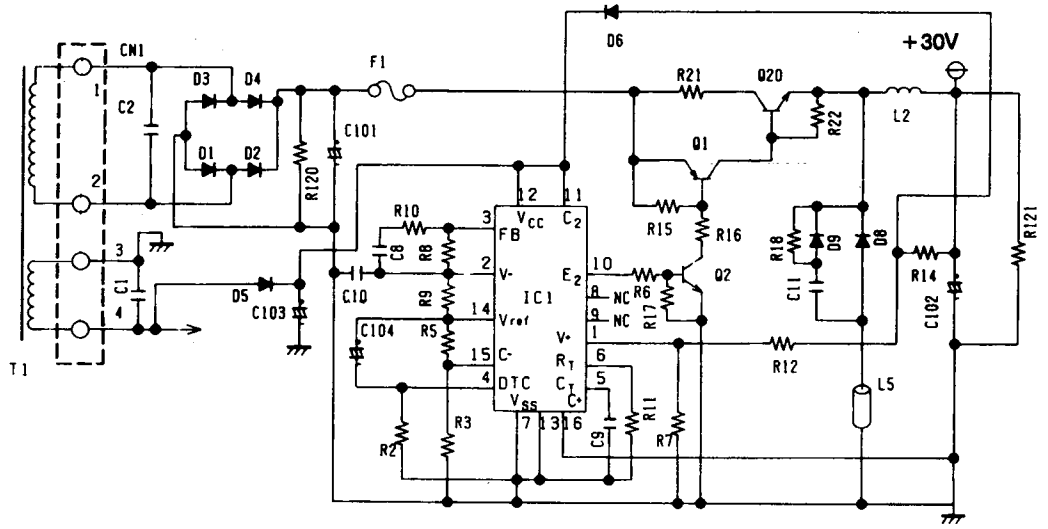


(2) Power Circuitry

(a) 27V Switching Regulator Circuit

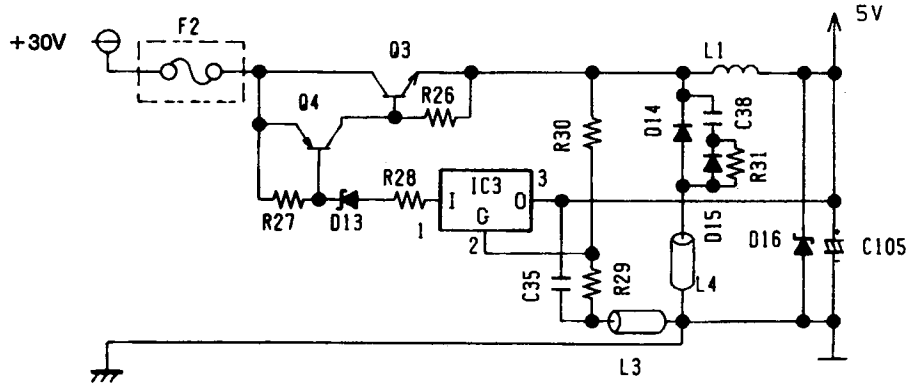
The AC 27V, provided from secondary transformer, is rectified by a bridge circuit (consisting of D1, D2, D3, D4), and a stabilized DC voltage (30V) is provided. IC1 (μPC494) is a fixed frequency, pulse width modulation control circuit designed for switching mode power supply control.

Pin ⑫ is the "Vcc" input terminal and the circuit consisting of C1, D5 and C103 provides about DC+13V. Pin ⑭ is the "reference voltage" output terminal which provides DC+5V. The switching frequency is determined by resistor R11 (connected with pin ⑥) and capacitor C6 (connected with pin ⑤). Normally, pin ④ is used for "DEAD TIME CONTROL", but in this circuit it is used for "SOFT START" when power is turned on.



(b) 5V Switching Regulator Circuit

5V is provided by switching 30V. Usually IC3(78L05) is used as a "Series Regulator". But in this circuit, IC8 is used as a switching control circuit with reference voltage, 5V. The principle of switching is the same as that of circuits which use IC1. When the output voltage of IC3 is less than the reference voltage, Q3 turns on, and when it reaches limit voltage, Q3 turns off.
The fixed voltage, about 5V is retained by repeating this operation. The switching frequency is determined by resistors R29 and R30. It is about 30KHz at 0.5A load.

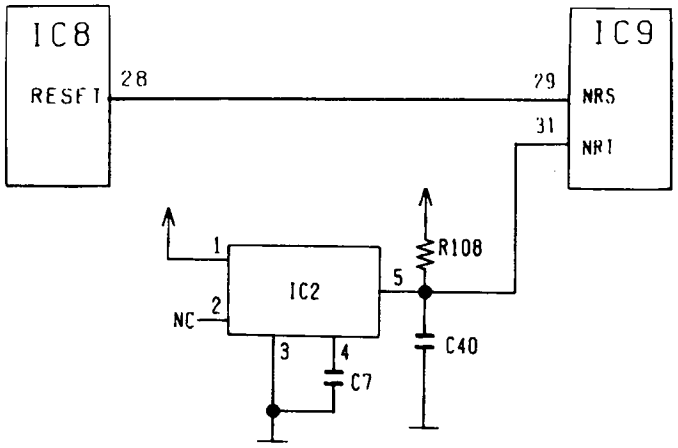


8.2.2 Reset Circuit

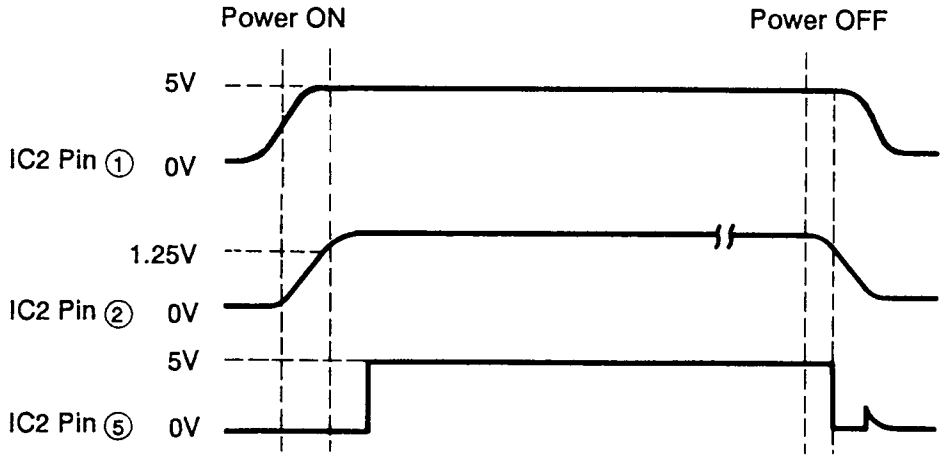
The reset circuit is provided to initialize the single chip CPU [μPD7810HCW(IC8)] and the gate array(IC9). About 30 msec after the voltage at IC2 pin ① reached at approximately 4.5V, the reset terminal changes from L to H. In the initial power-on state, capacitor C7 is not charged, and IC2 pin ⑤ (out) is at the L level. About 30 msec after stabilization of the +4.5V, IC2 pin ⑤ changes from L to H. The output of this kind of delay circuit is sent to IC8 and IC9 and the reset operation is performed.

The output of IC9 is L when the voltage drops, such as at power OFF times, causing the charge accumulated on C7 to be quickly discharged.

Since the CPU cannot control the printhead, carriage motor or paper feed motor during the reset pulse, each drive transistor array's base is fixed at the L level, by gate array (IC9) in order to prevent these components from moving.



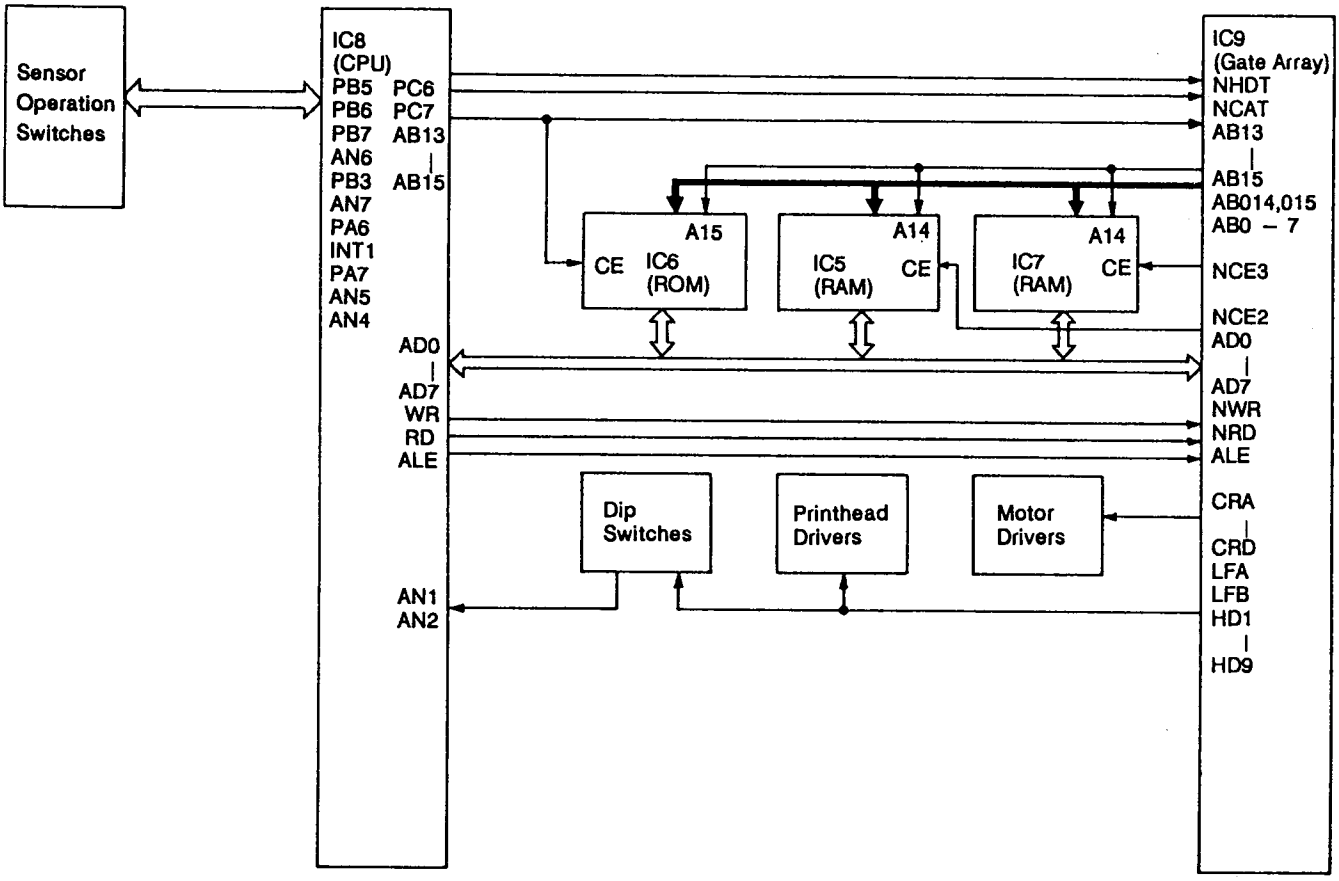
Timing Chart



8.2.3 CPU, Gate Array and Peripheral Circuit Block

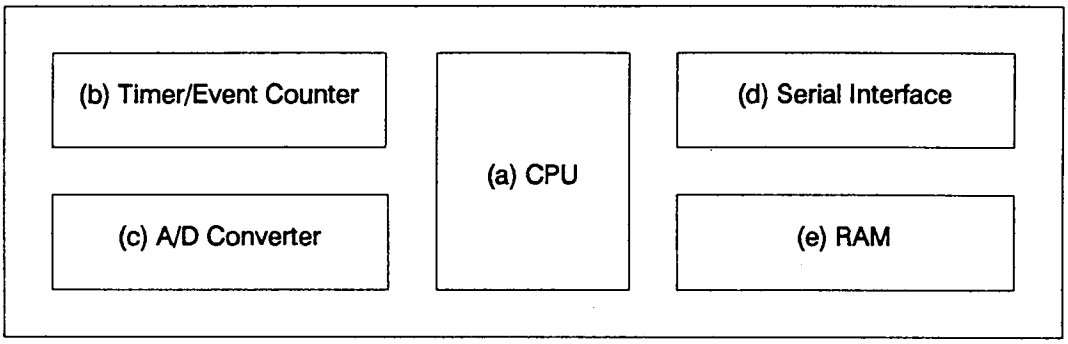
(1) This block diagram consists of the CPU(IC8), Gate Array(IC9), ROM(IC6), RAM(IC5) and optional RAM(IC7). It receives the data from the host computer, processes the input from the printhead over-heat sensor and operation switch, and controls the carriage, paper feed motors and the printhead.

ROM(IC6) contains the operation program, which controls data processing and mechanical function and the character generator, which determines the appearance of the characters.



(2) CPU Functions

μPD7810HCW (IC8) Block Diagram



(a) CPU
This block consists of the Program Counter, Arithmetic Logic Unit and Instruction Decoder. It fetches the program from the ROM, decodes the instructions, and processes them accordingly.

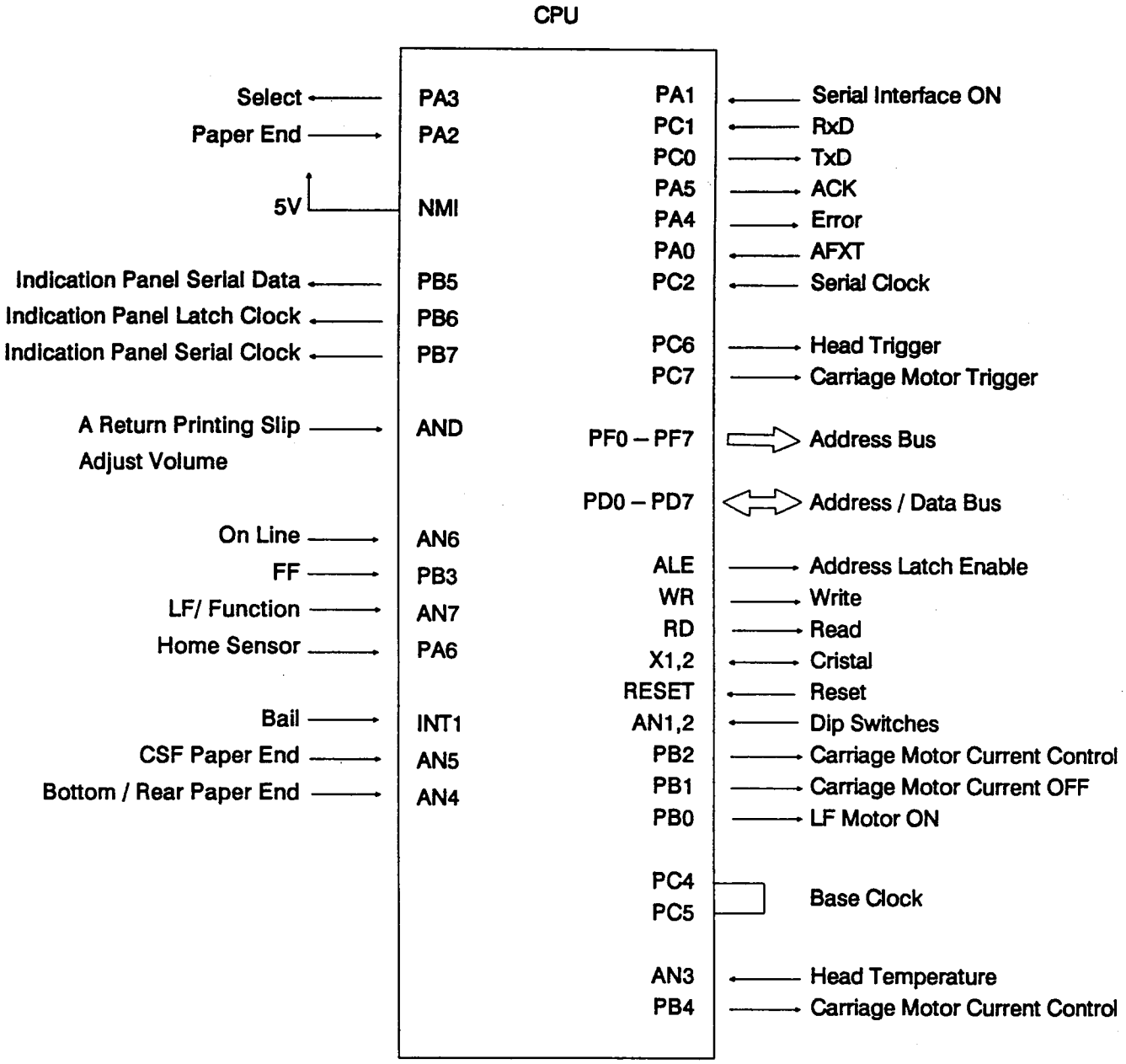
(b) Timer/Event Counter
This block consists of a 16-bit Timer/Event Counter X1 and a 8-bit Timer X2. These timers are used for basic timing and motor control.

(c) A/D Converter
8-channel/8-bit A/D Converter is prepared for use of key data input and by-directional print position adjustment VR data input.

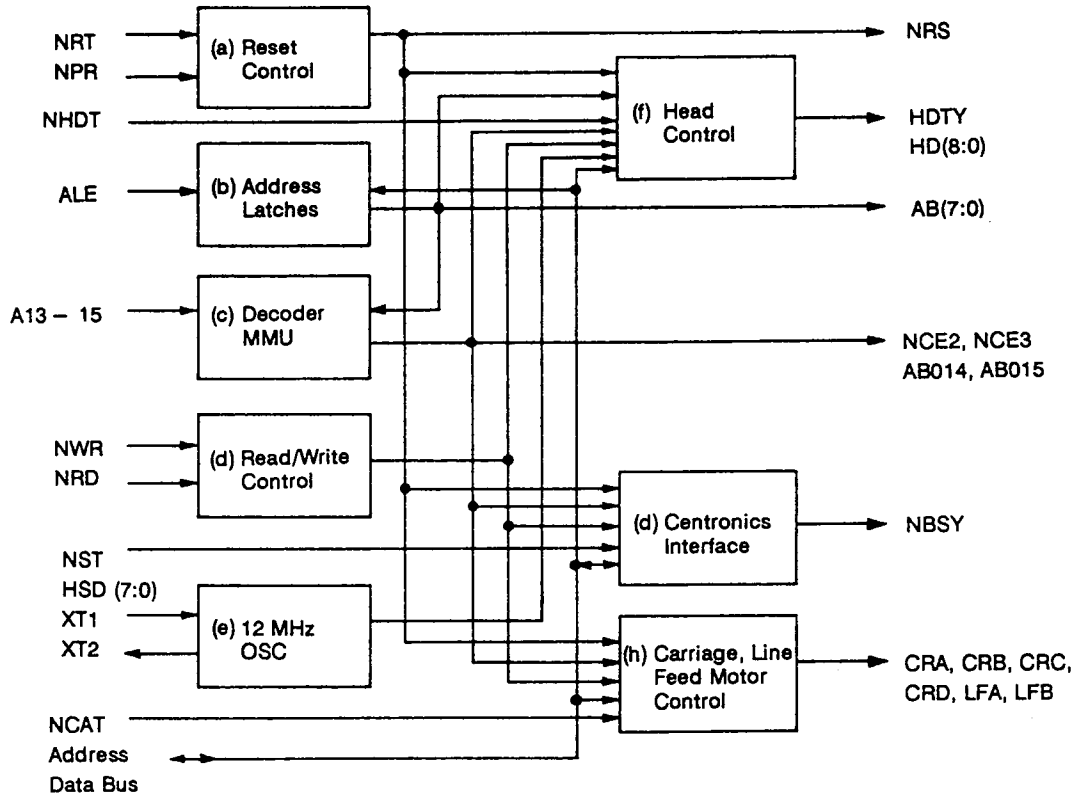
(d) Serial Interface
This block is used to connect the optional of communication interface (asynchronous). And this interface block supports under the 9600 baud rate.

(e) RAM
256 bytes RAM are installed in the CPU.

(3) CPU Pin Functions
The pin functions are as follows.



(4) Gate Array (IC9)
IC9 is a 64 – Pin Shrink Dip Package and it consists of 7 blocks as shown below.



(a) Reset Control
NRS signal, generated by AND of Reset IC and IF Prime signals, performs resetting of the CPU, Gate Array and Interface option.

(b) Address Latches
Address Latch Enable (ALE) signal latches Address Data Bus and generates AB (7 – 0) signal.

(c) Decoder / MMU (Memory Management Unit)
A decoder signal is generated by decoding the Addresses of 13,14 and 15 for register of the Head, Centronics IF, Motor and others.
MMU with Bank Register perform the expansion of Address space.

(d) Read / Write Control
Read / Write signal with decoder control the read and write of the registers.

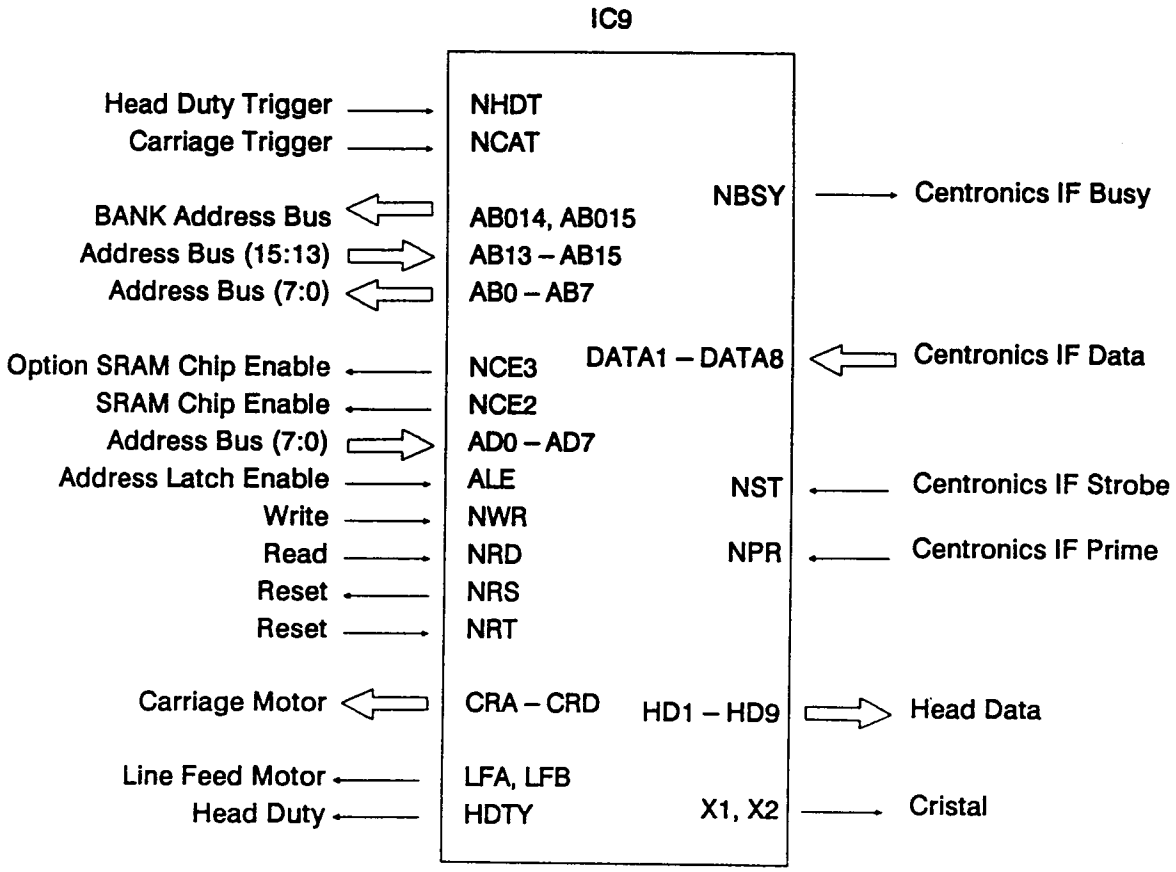
(e) 12 MHz OSC (Oscillator)
12 MHz OSC makes Gate Array internal clock.

(f) Head Control
Head Control signal controls the Head Pin fire time from start to finish.

(g) Centronics Interface
Gate Array automatically generates Busy signal triggered by data input and Strobe signals.

(h) Carriage / Line Feed Motor Control
Gate Array controls the movement of carriage and line feed motors like a out put port.

(5) Gate Array (IC9) Pin Function
The pin functions are as follows.



(6) Chip Select Block
Gate Array have a MMU (Memory Management Unit).
CPU Memory Space expands from 64K bytes to 128K bytes by MMU.
The tables blow shows the levels of address signals used to select the corresponding memory area.

Memory Map

	BANK0	BANK1	BANK2	BANK3
ABO15	0		1	
ABO14	0	1	0	1
0	ROM1 (0 – 16KB)			
16K		ROM1 (16 – 32KB)	ROM1 (32 – 48KB)	ROM1 (48 – 64KB)
32K	Optional RAM (0 – 16KB) *1	Optional RAM (16 – 32KB) *1	Optional RAM (0 – 16KB) *2	Optional RAM (16 – 32KB) *2
48K	STANDARD RAM (4K Bytes)			
56K	I/O (Head, Parallel I/O, Control Panel, Motor, etc.)			
64K	Include CPU RAM (256 Bytes)			

Note: *2 reflected in the *1.

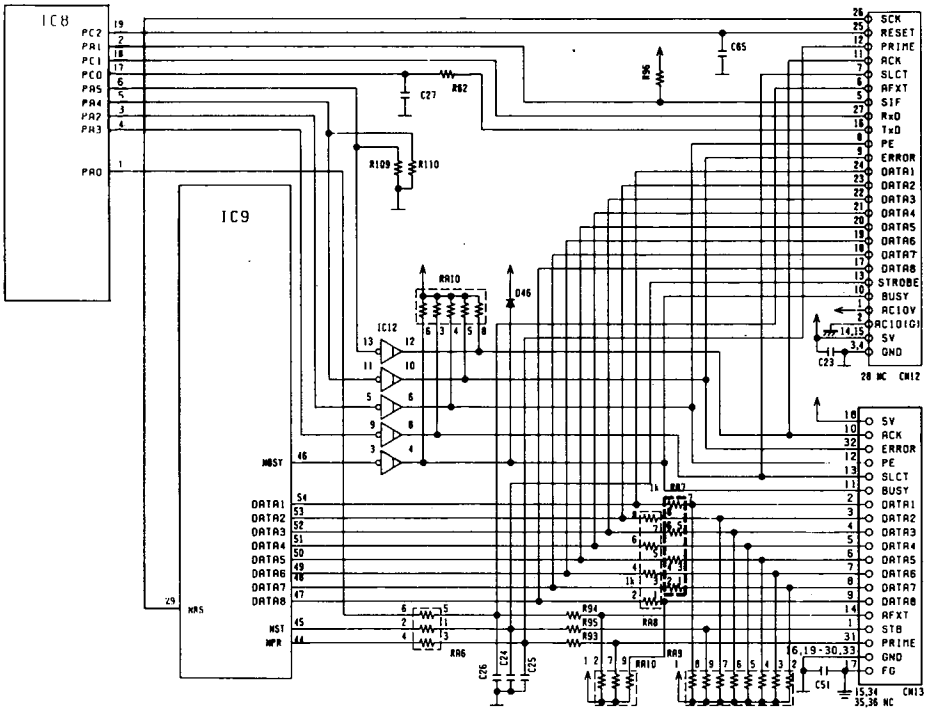
8.2.4 Parallel Interface Circuit

The Interface Block receives data from the host computer and generates the appropriate status signals. The handshake method is described in the following steps.

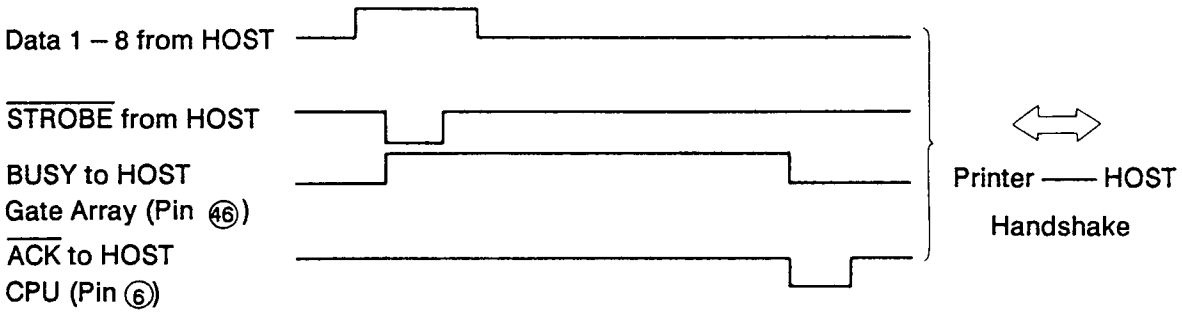
Process

(1) A $\overline{\text{STROBE}}$ signal is sent from the host computer and is used to set the internal latch of the Gate Array. At the same time Gate Array pin ㊻ sends a BUSY signal to the host computer through IC12 pin ④.
(2) The CPU checks the Gate Array internal latch periodically and checks whether a $\overline{\text{STROBE}}$ is sent or not.
(3) If a $\overline{\text{STROBE}}$ signal has been sent, the CPU reads the data from Gate Array HS ports (DATA1– DATA8). Then the internal latch is cleared automatically.
(4) When the BUSY signal disappears, an $\overline{\text{ACK}}$ (Acknowledge) signal is sent to the host computer during the time determined by software.
(5) The CPU then judges the received data as to whether it is a character code, control code or bit image data and processes the data accordingly.
(6) The CPU processes another command (for instance; operation switch state check, motor drive during print).

Thus the data received by handshake is accomplished.



Timing Chart



8.2.5 Carriage Motor Drive Block

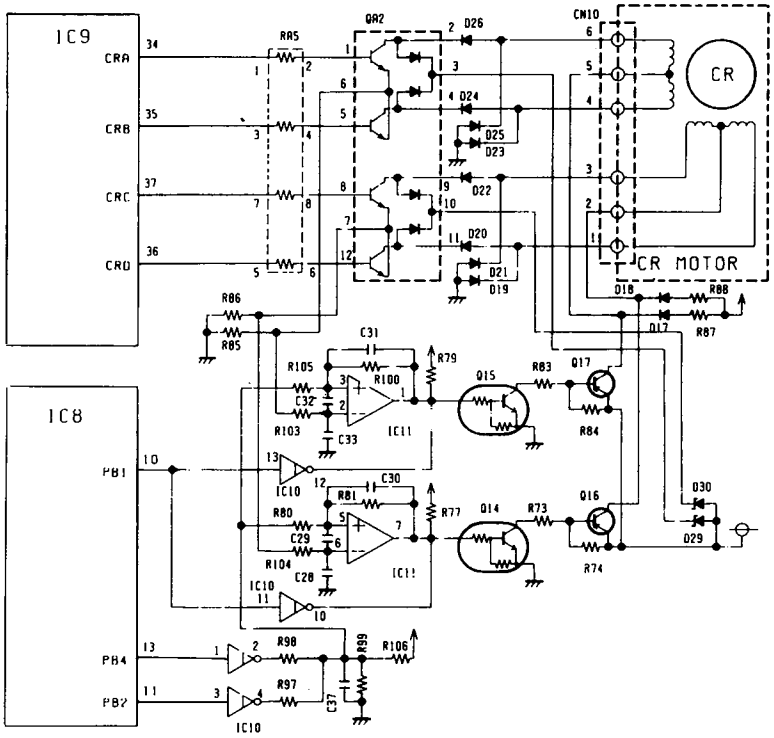
The Carriage motor is driven by the four signals from CRA, CRB, CRC and CRD, which are shifted 90 degrees from each other.

IC9 pins ㉞ and ㉟ are used to excite one winding (two phases) of the stepping motor, while pins ㊱ and ㊲ excite the other two phases, creating a 2-2 driving system.
The time interval is determined by the CPU's interval counter clock as generated from the CPU's clock.

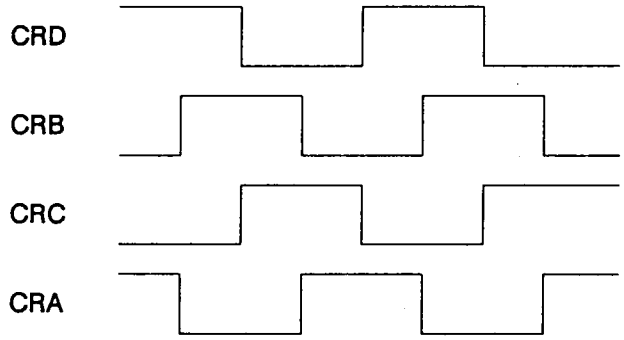
This circuit is a chopper drive circuit for fixing the amount of the current through the motor during stepping and has two threshold voltages (VSH, VSL). IC11 compares the voltage drop across R85(R86) which is proportional to the current through the motor. For example, when the voltage drop across R85(R86) is larger than VSH, IC11 is turned off and Q15(Q14) is turned off, then Q17(or Q16) is turned off. At the same time, the current through the motor decreases, because the voltage drop across R85(R86) decreases. When this voltage drop is smaller than VSL, IC11 is turned on, and the current through the motor increases.

The amount of current through the motor is fixed during stepping by repeating this process.

These threshold voltages (VSH, VSL) are changed by PB4 (PB2) H or L signal according to the print mode. When the motor is in the standby state, Q17 and Q16 are turned off, and a holding voltage is supplied to the motor through R87 and R88.



Timing Chart



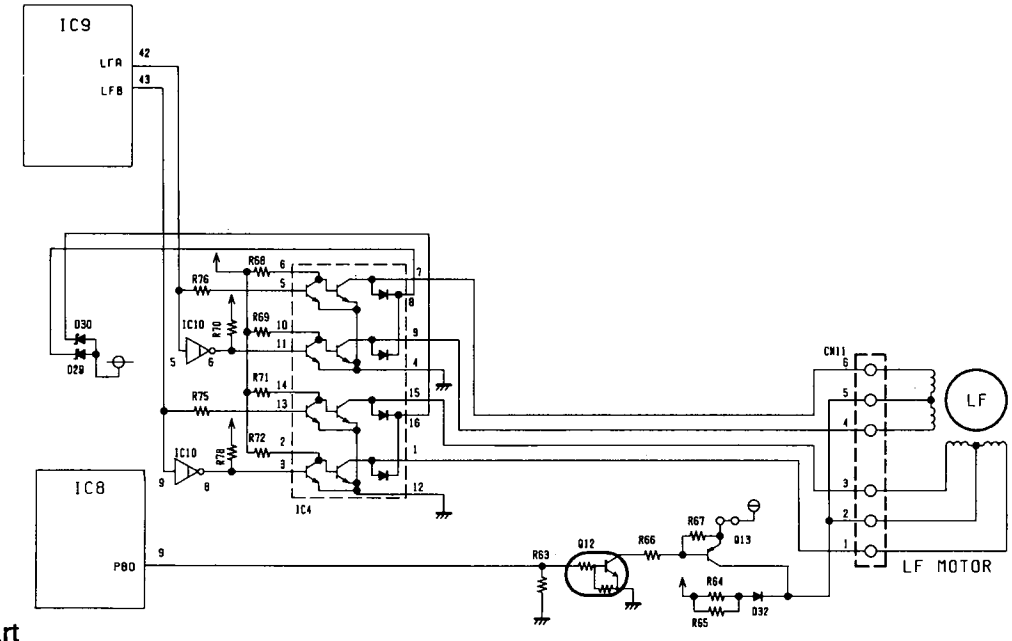
Pulse Rate Chart

The relation between the printing mode and the pulse rate is shown in the chart.

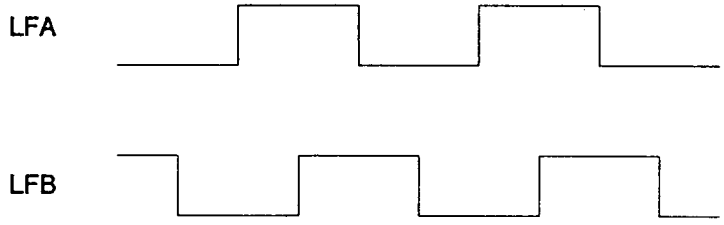
Printing Mode	Pulse Rate (PPS)
Pica	960
Elite	800
640 Dots Image	720
720 Dots Image	640
10 cpi N.L.Q	480
12 cpi N.L.Q	400
15 cpi N.L.Q	320
17 cpi N.L.Q	240

8.2.6 Paper Feed Motor Drive Block

During paper feed, the CPU sets PB0 at the H level and turns on Q12 and Q13. +30V is fed to the motor as a result. The exciting method by LFA, LFB is 2-2 driving system and the pulse rate is 475 pulse per second. When paper feed is not done, Q13 is turned off because of LFA, LFB H level signal and a holding voltage (about 2V) is supplied to the motor through R64 and R65.

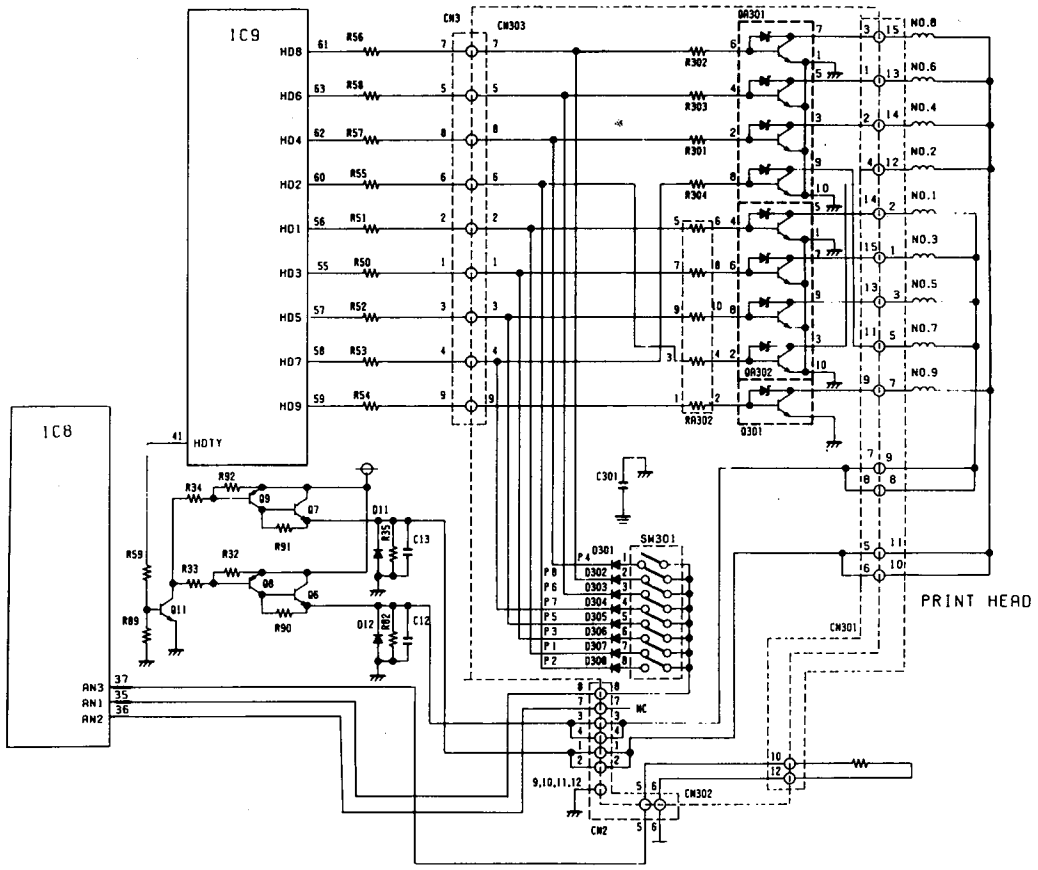


Timing Chart

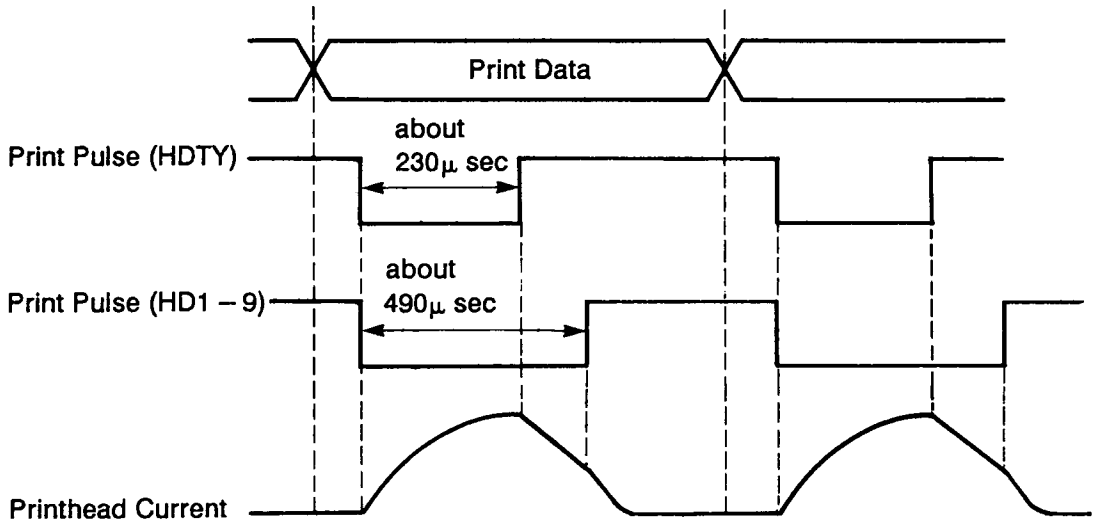


8.2.7 Head Drive Block

This block consists of QA301, 302, Q6, Q7, Q8, Q9 and Q11. QA301, 302 and Q301 control each pin and Q6 – 9 and Q11 control the power supplied to the printhead.
The CPU sets the data to be printed into HD1– 9 of IC9 (Gate Array). Then the CPU sets the printing pulse and triggers PC6 terminal of IC8. By the printing pulse, the head pin solenoids are driven by QA401, 402, and Q301 accordingly. The power supplied to the printhead is controlled by HDTY through Q6 and Q7. And the power supplied to the printhead is restricted by the output of HDTY in the Gate Array.
Posistor is attached in the printhead and is used for detecting overheat of printhead in directly.



Timing Chart



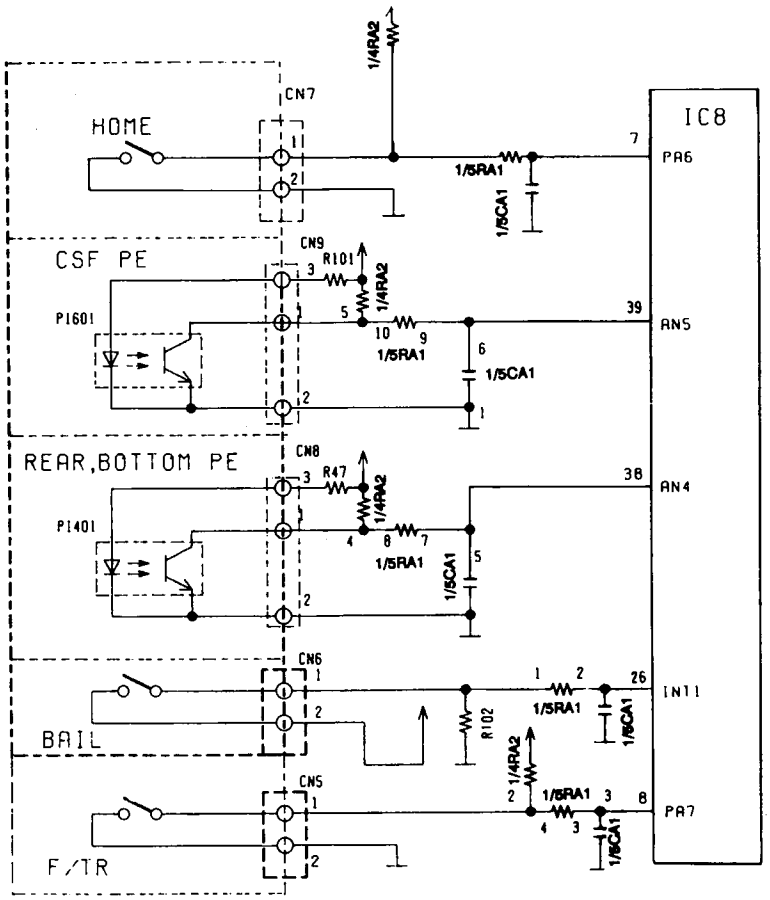
8.2.8 Sensor and Switch Circuits

(1) The purpose of the home position switch is to move the carriage to a reference position (home position) at the left end of the carriage when the power switch is turned on or when a Reset signal is generated. When the carriage comes to the home position, PA6 (pin ⑦) changes from H to L level.

(2) A bottom/rear paper out sensor is provided. When this sensor detects paper out, AN5 (pin ㊴) changes from L to H and the LED flashes to indicate paper out status.

(3) A CSF paper out sensor is provided. When this sensor detects paper out, AN4 (pin ㊳) changes from L to H and the LED flashes to indicate paper out status.

(4) If paper feed switch is set to the friction position, AN6 (pin ㊵) is L and the CPU does not check paper out sensor.



8.2.9 Control Panel

The control panel is composed of 4 switches and 7 LEDs.

(1) The ON LINE switch switches between on-line and off-line, and is input to the CPU (pin ㊵). This switch is also used for continuous paper back in the function mode.

(2) The paper feed switch is for one-line paper feed and is input to the CPU (pin ㊶). This switch is also used for driving the carriage to the right in the function mode.

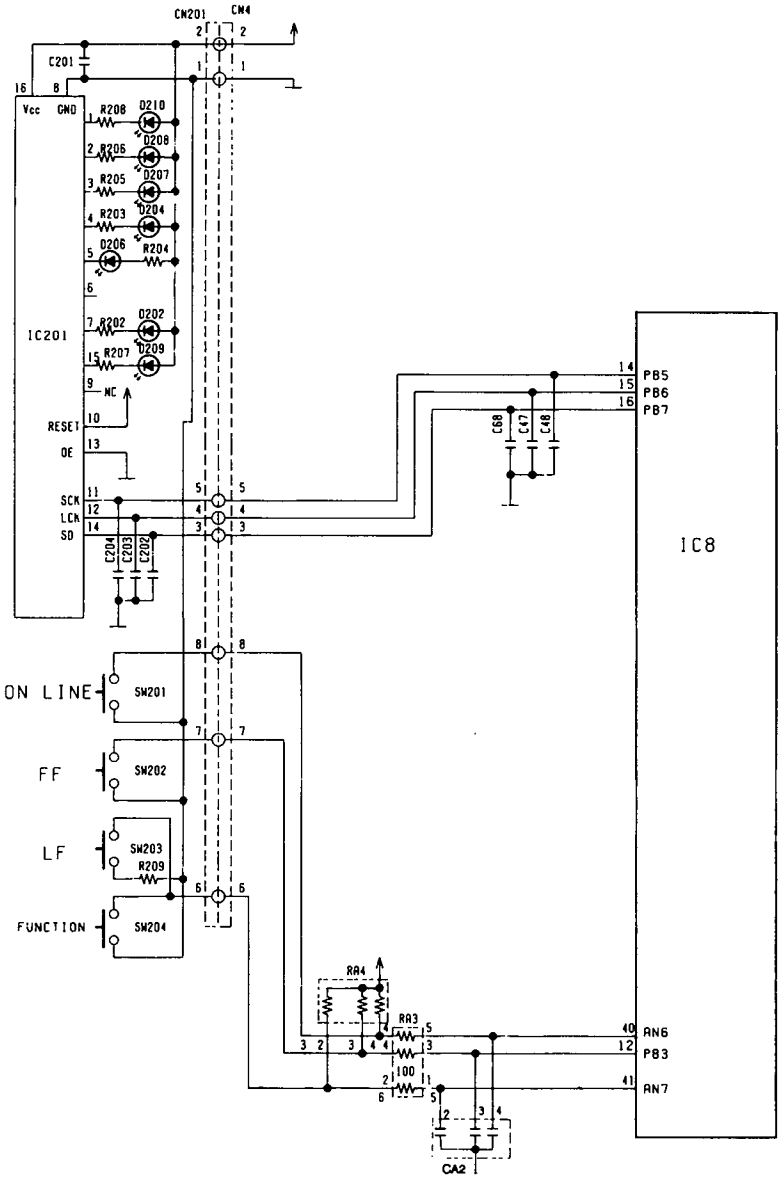
(3) The form feed switch is for one page-feed and is input to the CPU (pin ⑫). This switch is also used for driving the carriage to the left in the function mode.

(4) The function switch switches between the function mode and the normal operation mode. In the function mode, continuous paper back function and margin sets are available.

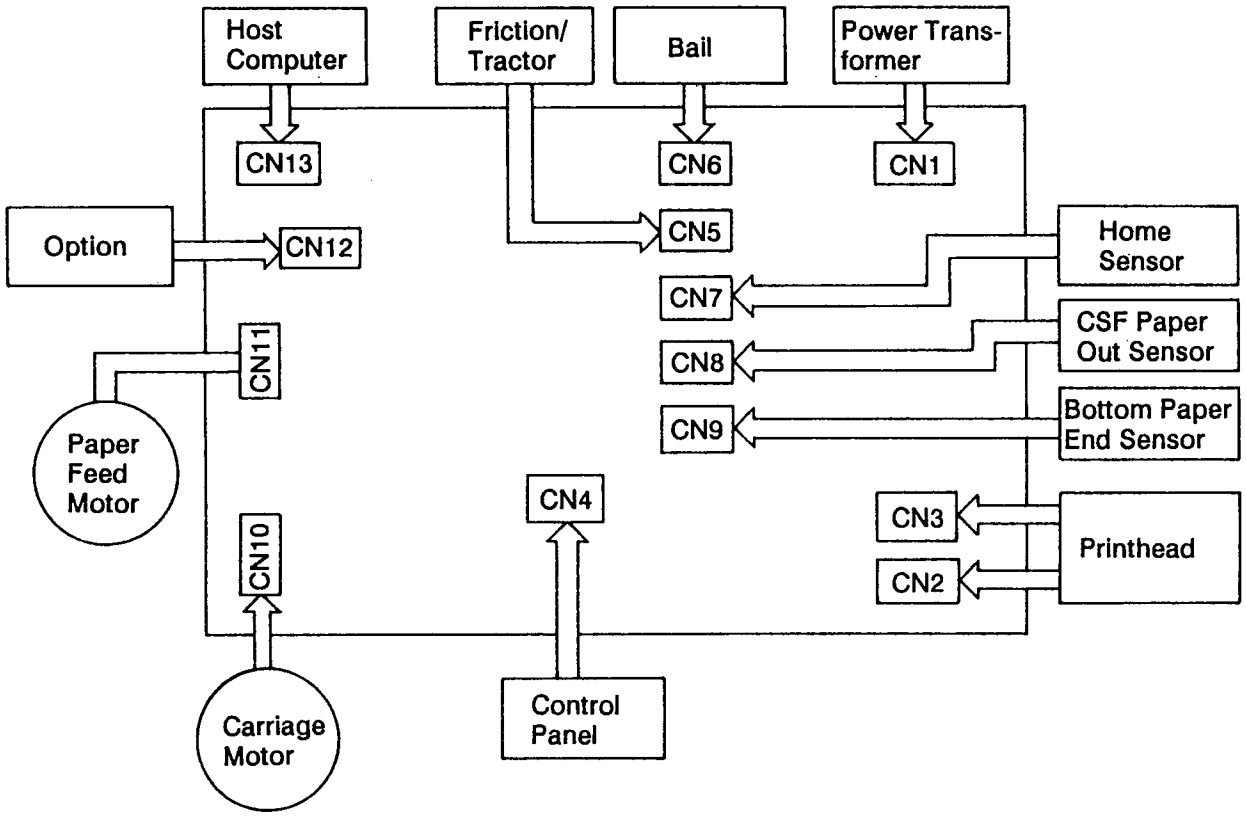
(5) The power/paper out LED lights when power is turned on and blinks when paper out is detected.

(6) The ON LINE LED displays the on-line status.

(7) Two ROW LEDs and three COLUMN LEDs display print mode by matrix.



8.2.10 Logic Board Connection Diagram



8.3 Explanation of Connectors

8.3.1 Name of Connectors

Connector applications are shown below. For details, refer to tables.

CN1	: Power Supply	CN8	: CSF Paper Out Sensor
CN2,CN302	: Printhead	CN9	: Bottom/Rear Paper Out Sensor
CN3,CN303	: Printhead	CN10	: Carriage Motor
CN4,CN201	: Control Panel	CN11	: Paper Feed Motor
CN5	: Friction/Tractor Switch	CN12	: Option I/O
CN6	: Bail Switch	CN13	: Centronics I/O
CN7	: Carriage Home Switch	CN301	: Printhead

8.3.2 Pin Assignment

CN1 (Power Supply)

Pin No.	Signal Name	Description	In/ Out
1	AC 27V	For Main Board	—
2	AC 27V	For Main Board	—
3	AC 10V	For Optional Board	—
4	AC 10V	For Optional Board	—

CN9 (Bottom/Rear Paper Out Sensor)

Pin No.	Signal Name	Description	In/ Out
1	Anode	+5V Supply	Out
2	Cathode	Signal Ground	—
3	Collector	Paper Out Sensor	In

CN5 (Friction / Tractor Switch)

Pin No.	Signal Name	Description	In/ Out
1	SW	Friction / Tractor Switch	In
2	SG	Signal Ground	—

CN10 (Carriage Motor)

Pin No.	Signal Name	Description	In/ Out
1	CRD	Phase D for CarriageMotor	In
2	SCR	Carriage Motor Power Supply	Out
3	CRC	Phase C for Carriage Motor	In
4	CRB	Phase B for Carriage Motor	In
5	SCR	Carriage Motor Power Supply	Out
6	CRA	Phase A for Carriage Motor	In

CN6 (Bail Switch)

Pin No.	Signal Name	Description	In/ Out
1	SW	Bail Switch	In
2	SG	Signal Ground	—

CN7 (Carriage Home Switch)

Pin No.	Signal Name	Description	In/ Out
1	SW	Carriage Home Switch	In
2	SG	Signal Ground	—

CN11 (Paper Feed Motor)

Pin No.	Signal Name	Description	In/ Out
1	LFD	Phase D for Line Feed Motor	In
2	SLF	Line Feed Motor Power Supply	Out
3	LFC	Phase C for Line Feed Motor	In
4	LFB	Phase B for Line Feed Motor	In
5	SLF	Line Feed Motor Power Supply	Out
6	LFA	Phase A for Line Feed Motor	In

CN8 (CSF Paper Out Sensor)

Pin No.	Signal Name	Description	In/ Out
1	Anode	+5V Supply	Out
2	Cathode	Signal Ground	—
3	Collector	Paper Out Sensor	In

CN4, CN201 (Control Panel)

Pin No.	Signal Name	Description	In/ Out
1	SG	Signal Ground	—
2	+5V	+5V Supply	Out
3	DATA	IC301 LED Data In	Out
4	LCLK	IC301 Latch Clock	Out
5	SCLK	IC301 LED Data Shift Clock	Out
6	LF	Friction LF/COLUMN Switch	In
7	FF	ROW/FF Switch	In
8	ON LINE	SET/ONLINE Switch	In

CN2, CN302 (Printhead)

Pin No.	Signal Name	Description	In/ Out
1	SG	Signal Ground	—
2	SG	Signal Ground	—
3	SG	Signal Ground	—
4	SG	Signal Ground	—
5	DS1	Dip SW401 Signal	In
6	DS2	Dip SW402 Signal	In
7	SG	Signal Ground	—
8	OHP	Over Heat Protector	In
9	+27V	+27V for Pin 1, 3, 5, 7	Out
10	+27V	+27V for Pin 1, 3, 5, 7	Out
11	+27V	+27V for Pin 2, 4, 6, 8, 9	Out
12	+27V	+27V for Pin 2, 4, 6, 8, 9	Out

CN301 (Printhead)

Pin No.	Signal Name	Description	In/ Out
1	H3	Head Pin 3 Drive	In
2	H1	Head Pin 1 Drive	In
3	H5	Head Pin 5 Drive	In
4	OHP	Over Heat Protector	In
5	H7	Head Pin 7 Drive	In
6	SG	Signal Ground	—
7	H9	Head Pin 9 Drive	In
8	+30V	+30V for Pin 1, 3, 5, 7	Out
9	+30V	+30V for Pin 1, 3, 5, 7	Out
10	+30V	+30V for Pin 2, 4, 6, 8, 9	Out
11	+30V	+30V for Pin 2, 4, 6, 8, 9	Out
12	H2	Head Pin 2 Drive	In
13	H8	Head Pin 8 Drive	In
14	H4	Head Pin 4 Drive	In
15	H6	Head Pin 6 Drive	In

CN3, CN303 (Printhead)

Pin No.	Signal Name	Description	In/ Out
1	HD4	Head Pin 4 Drive	In
2	HD7	Head Pin 7 Drive	In
3	HD8	Head Pin 8 Drive	In
4	HD2	Head Pin 2 Drive	In
5	HD6	Head Pin 6 Drive	In
6	HD9	Head Pin 9 Drive	In
7	HD5	Head Pin 5 Drive	In
8	HD1	Head Pin 1 Drive	In
9	HD3	Head Pin 3 Drive	In

CN13 (Centronics I/O)

Pin No.	Return Side Pin No.	Signal Name	Description	I/O
1	19	$\overline{\text{STB}}$	Strobe	In
2	20	DATA 1	Parallel DATA 1	In
3	21	DATA 2	Parallel DATA 2	In
4	22	DATA 3	Parallel DATA 3	In
5	23	DATA 4	Parallel DATA 4	In
6	24	DATA 5	Parallel DATA 5	In
7	25	DATA 6	Parallel DATA 6	In
8	26	DATA 7	Parallel DATA 7	In
9	27	DATA 8	Parallel DATA 8	In
10	28	$\overline{\text{ACK}}$	Acknowledge	Out
11	29	BUSY	Busy	Out
12		PE	Paper End	Out
13		SLCT	Select	Out
14		$\overline{\text{AFXT}}$	Auto Feed XT	In
15		——	——	——
16		SG	Signal Ground	——
17		FG	Frame Ground	——
18		+5V	+5V	Out
31	30	$\overline{\text{PRIME}}$	Prime	In
32		$\overline{\text{ERROR}}$	Error	Out
33		SG	Signal Ground	——
34		——	——	——
35		——	——	——
36		——	——	——
19-30		SG	Signal Ground	——

CN12 (Option I/O)

Pin No.	Signal Name	Description	I/O
1	AC 10V	AC 10V for Serial Option	
2	AC 10V	AC 10V for Serial Option	
3	SG	Signal Ground	
4	SG	Signal Ground	
5	SIF	Check of Option Board	In
6	$\overline{\text{AFXT}}$	$\overline{\text{Auto Feed XT}}$	In
7	SLCT	Select	Out
8	PE	Paper End	Out
9	$\overline{\text{ERROR}}$	$\overline{\text{Error}}$	Out
10	BUSY	Busy	Out
11	$\overline{\text{ACK}}$	$\overline{\text{Acknowledge}}$	Out
12	$\overline{\text{PRIME}}$	$\overline{\text{Prime}}$	In
13	$\overline{\text{STB}}$	$\overline{\text{Strobe}}$	In
14	+5V	+5V Supply	Out
15	+5V	+5V Supply	Out
16	TxD	Transmitted Data	Out
17	DATA 8	Parallel DATA 8	In
18	DATA 7	Parallel DATA 7	In
19	DATA 6	Parallel DATA 6	In
20	DATA 5	Parallel DATA 5	In
21	DATA 4	Parallel DATA 4	In
22	DATA 3	Parallel DATA 3	In
23	DATA 2	Parallel DATA 2	In
24	DATA 1	Parallel DATA 1	In
25	RESET	Reset to Option	Out
26	SCK	Serial Clock	In
27	RxD	Received Data	In
28	——	Not Used	

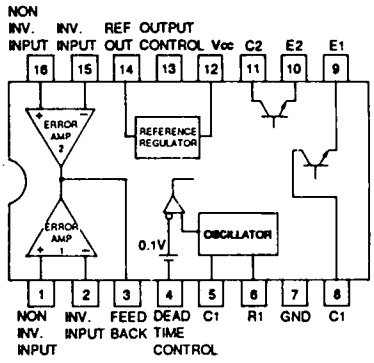
8.4 IC Pin Configuration

8.4.1 Logic Symbol Chart

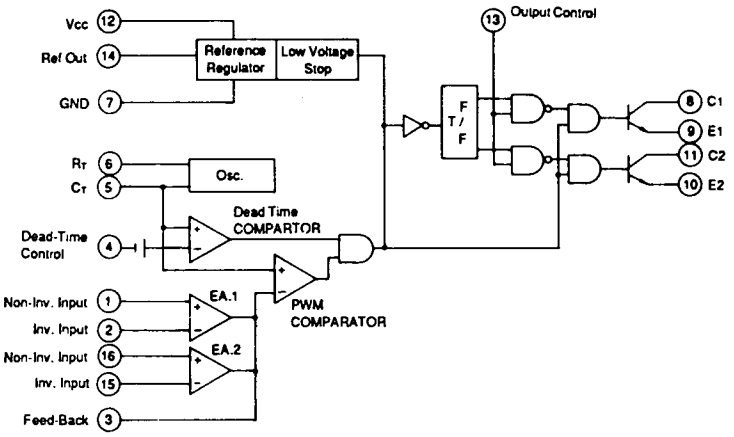
Positive Logic	Negative Logic	Truth Table
NOT A — C C = $\overline{A}$	A — C C = $\overline{A}$	A C L H H L
BUFFER A — C C = A	A — C C = A	A C L L H H
AND A, B — C C = AB	INVERT-NOR A, B — C C = $\overline{A+B}$	A B C L L L L H L H L L H H H

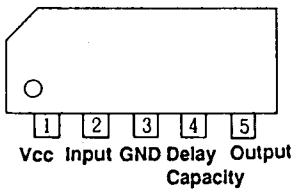
Positive Logic	Negative Logic	Truth Table
NAND A, B — C C = $\overline{AB}$	INVERT-OR A, B — C C = $\overline{A}+\overline{B}$	A B C L L H L H H H L H H H L
OR A, B — C C = A+B	INVERT-NAND A, B — C C = $\overline{AB}$	A B C L L L L H H H L H H H H
NOR A, B — C C = $\overline{A+B}$	INVERT-AND A, B — C C = $\overline{AB}$	A B C L L H L H L H L L H H L

8.4.2 Pin Configuration

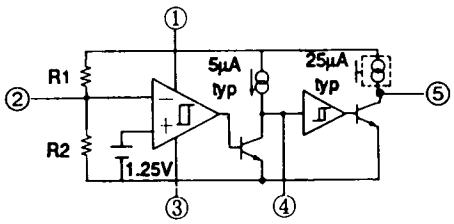


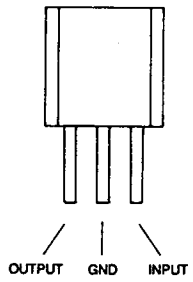
IC1
(μPC494)



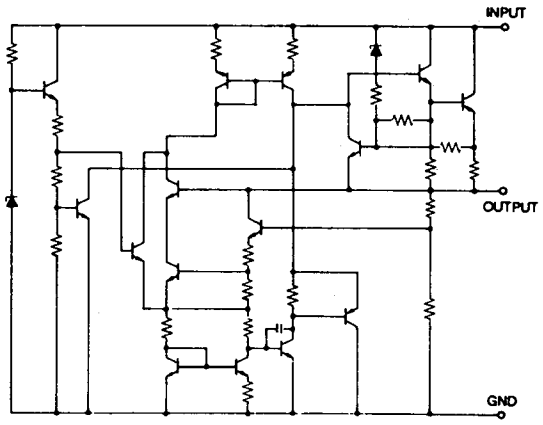


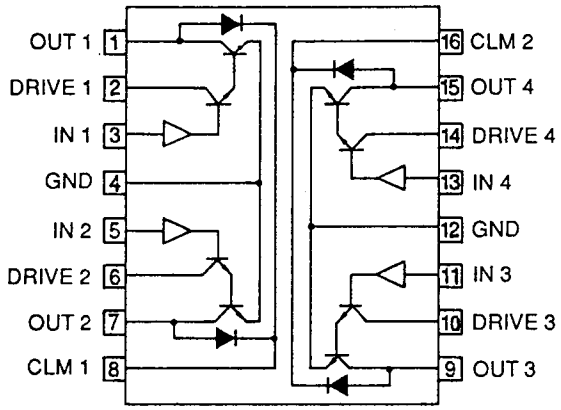
IC2
(M51953B)



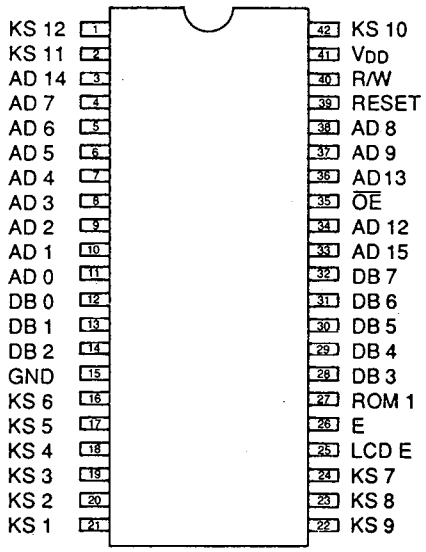


IC3
(78L05A)

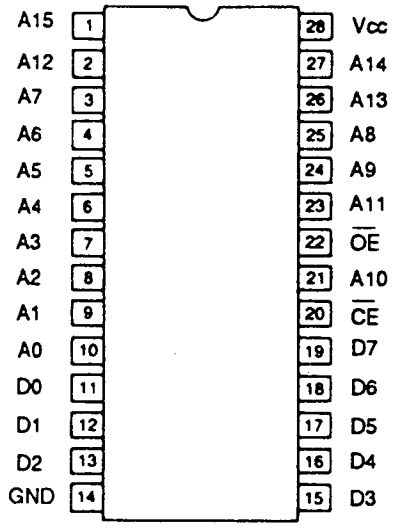




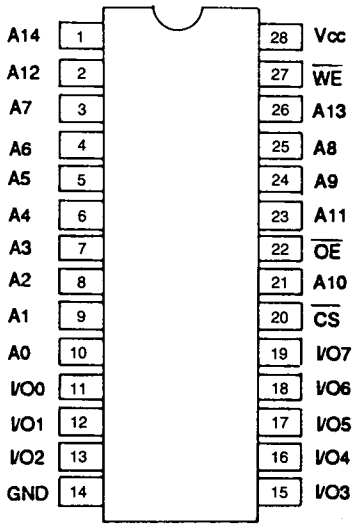
IC4
(M5266)



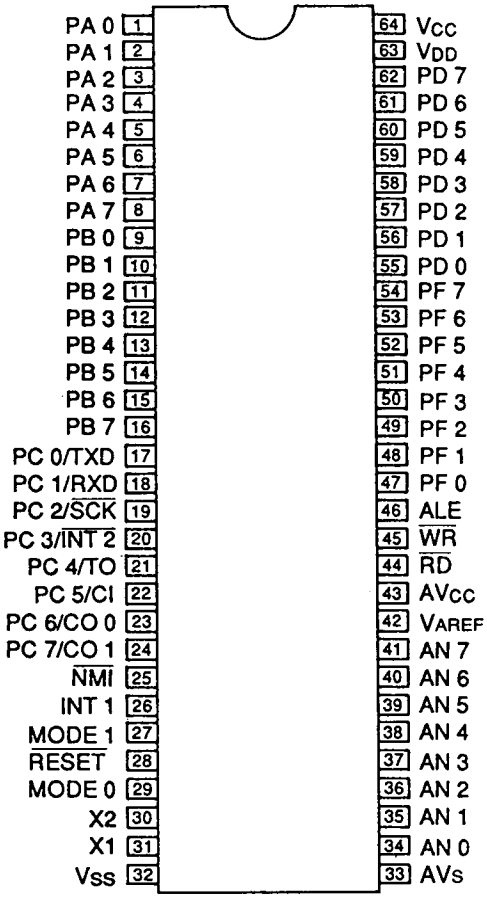
IC5 RAM
(MSM6364)



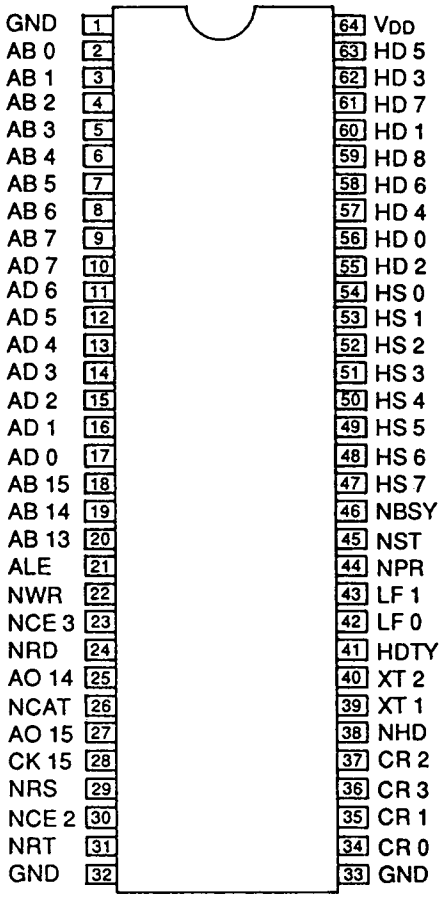
IC6 ROM
512K bit (27512)



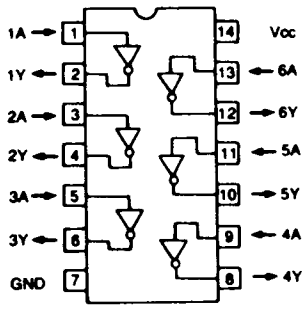
IC7 RAM
(MB84256)
Option



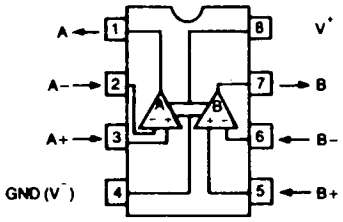
IC8 CPU
(D7811)



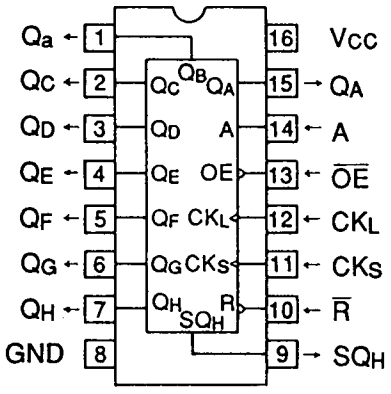
IC9 Gate Array
(μPD65006CW)



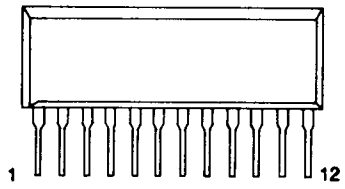
IC10, 12
(74LS05P)



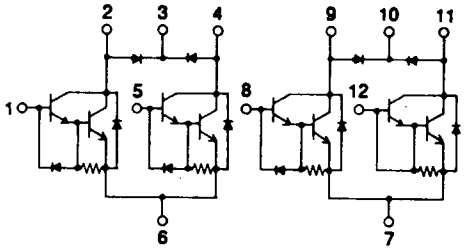
IC11
(LM393)



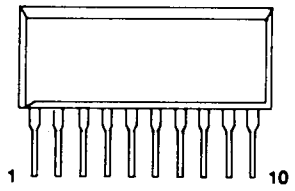
IC201
(M66312P)



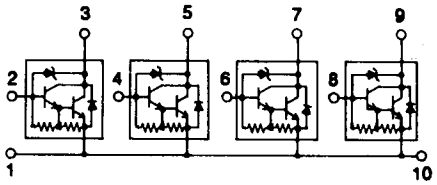
QA2
(MP4301)



Carriage Spacing Motor Driver



QA401, 402
(PU4123)



Printhead Driver

8.4.3 Pin Assignment

IC8 CPU

Pin No.	Symbol	Function	In/ Out
1	PA0	$\overline{\text{AFXT}}$ from Host	In
2	PA1	$\overline{\text{SIF}}$	In
3	PA2	PE	Out
4	PA3	SLCT	Out
5	PA4	$\overline{\text{ERROR}}$	Out
6	PA5	ACK	Out
7	PA6	Home Switch	In
8	PA7	Friction/Tractor Switch	In
9	PB0	LF Enable	Out
10	PB1	CR Enable	Out
11	PB2	CR Power Control 1	Out
12	PB3	From Feed Switch	In
13	PB4	CR Power Control 2	Out
14	PB5	LED Driver SCK	Out
15	PB6	LED Driver LCK	Out
16	PB7	LED Driver Data	Out
17	PC0/TxD	TxD	Out
18	PC1/RxD	RxD	In
19	PC2/SCK	Serial Clock	In
20	PC3/ $\overline{\text{INT2}}$	Not Used	
21	PC4/TO	Timer Out Connect to PC5	Out
22	PC5/CI	Timer In Connect to PC4	In
23	PC6/C0	Head Data Trigger	Out
24	PC7/CI	CR Trigger	Out
25	$\overline{\text{NMI}}$	+5V Pull Up	In
26	INT1	Bail Switch	In
27	MODE1	+5V Pull Up	In
28	$\overline{\text{RESET}}$	Reset	In
29	$\overline{\text{MODE0}}$	+5V Pull Up	In
30	X2	OSC OUT	Out
31	X1	OSC IN	In
32	Vss	GROUND	

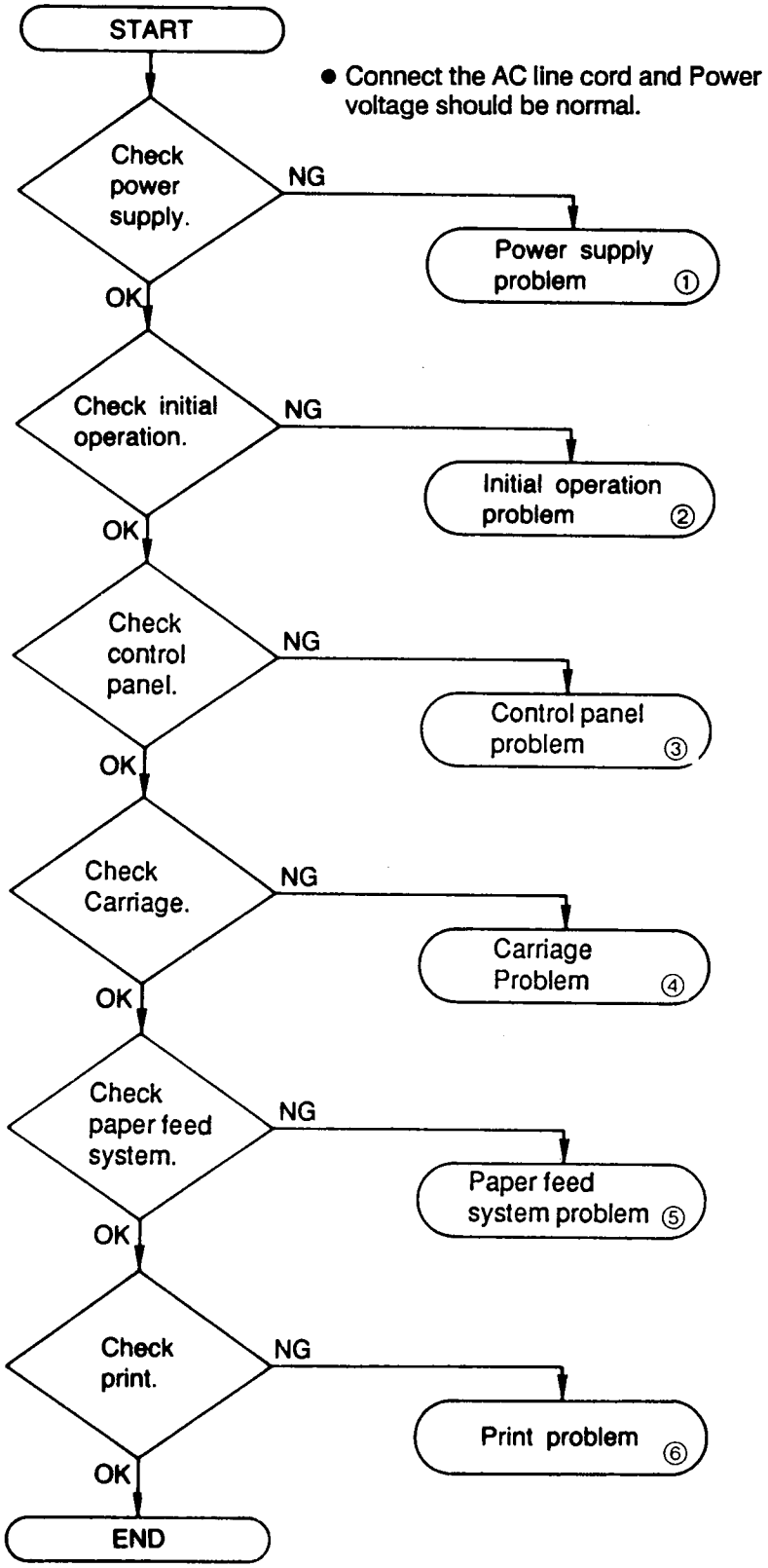
Pin No.	Symbol	Function	In/ Out
33	AVss	GROUND	
34	AN0	Print Timing Adjust	In
35	AN1	Dip Switch Data 1	In
36	AN2	Dip Switch Data 2	In
37	AN3	Overheat Protect	In
38	AN4	Rear, Bottom Paper Out	In
39	AN5	CSF Paper Out	In
40	AN6	Home Switch	In
41	AN7	Friction/LF Switch	In
42	V_{AREF}	+5V	
43	AVcc	+5V	
44	$\overline{\text{RD}}$	Read Enable	Out
45	$\overline{\text{WR}}$	Write Enable	Out
46	ALE	Address Latch Enable	Out
47	PF0	Address Bus 8	Out
48	PF1	Address Bus 9	Out
49	PF2	Address Bus 10	Out
50	PF3	Address Bus 11	Out
51	PF4	Address Bus 12	Out
52	PF5	Address Bus 13	Out
53	PF6	Address Bus 14	Out
54	PF7	Address Bus 15	Out
55	PD0	Address, Data Bus 0	In/Out
56	PD1	Address, Data Bus 1	In/Out
57	PD2	Address, Data Bus 2	In/Out
58	PD3	Address, Data Bus 3	In/Out
59	PD4	Address Data Bus 4	In/Out
60	PD5	Address Data Bus 5	In/Out
61	PD6	Address Data Bus 6	In/Out
62	PD7	Address Data Bus 7	In/Out
63	V_{DD}	+5V	
64	Vcc	+5V	

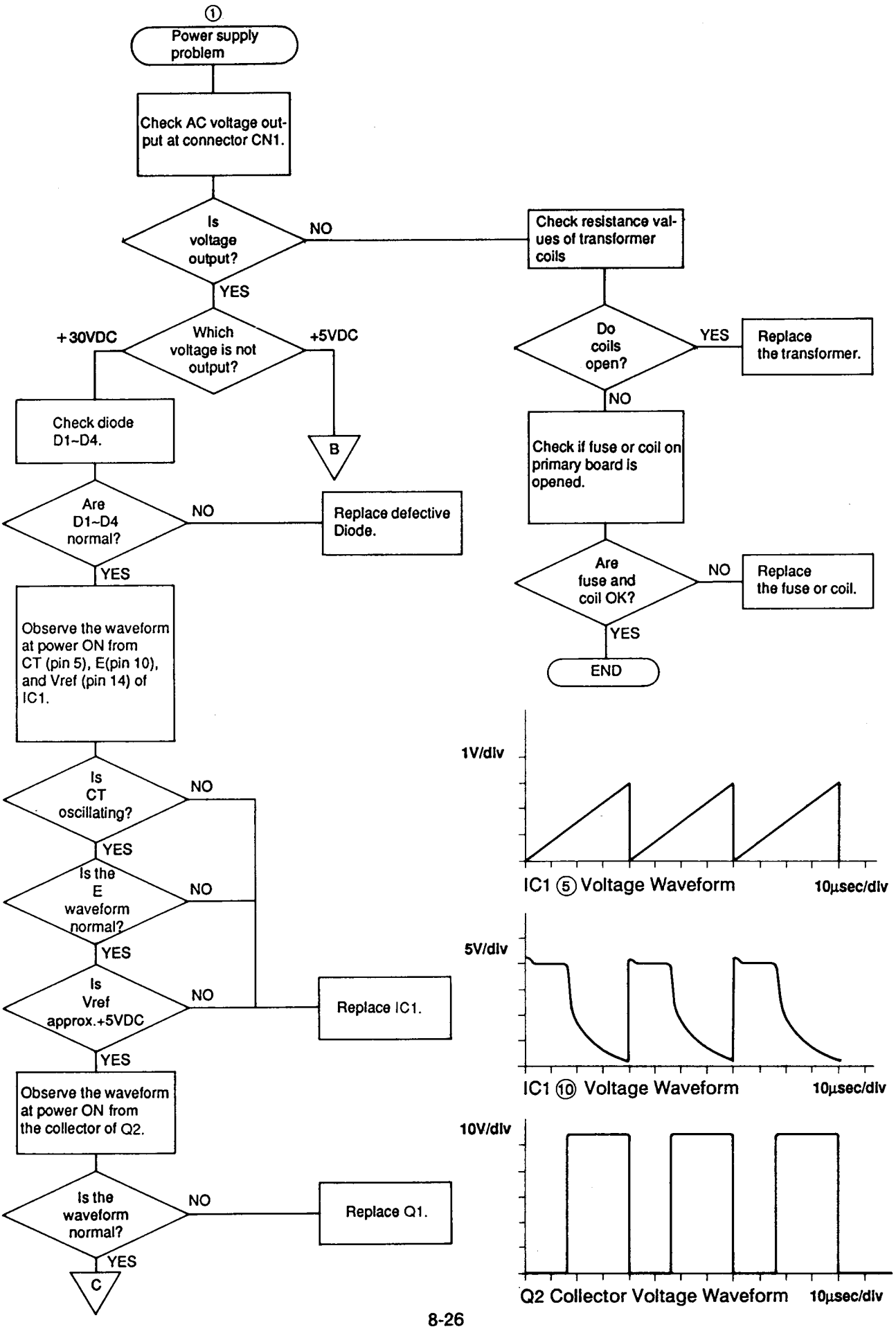
IC9 (Gate Array)

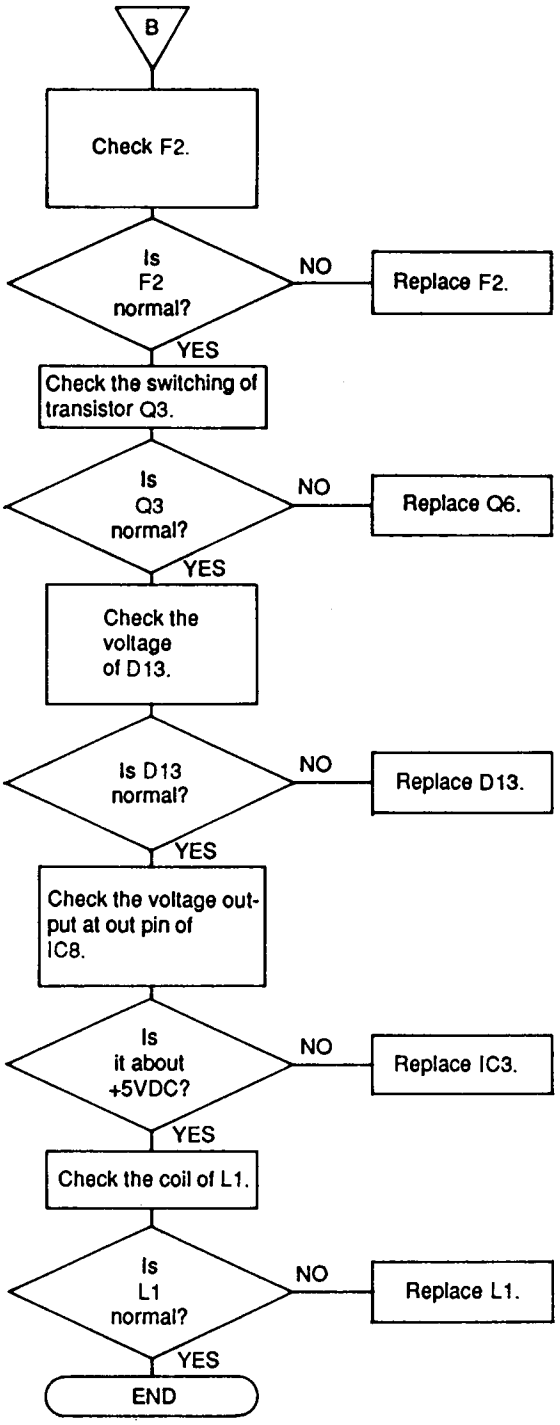
Pin No.	Symbol	Function	In/ Out
1	Vss	Ground	
2	AB0	Address Bus 0	Out
3	AB1	Address Bus 1	Out
4	AB2	Address Bus 2	Out
5	AB3	Address Bus 3	Out
6	AB4	Address Bus 4	Out
7	AB5	Address Bus 5	Out
8	AB6	Address Bus 6	Out
9	AB7	Address Bus 7	Out
10	AD7	Address Data Bus 7	In
11	AD6	Address Data Bus 6	In
12	AD5	Address Data Bus 5	In
13	AD4	Address Data Bus 4	In
14	AD3	Address Data Bus 3	In
15	AD2	Address Data Bus 2	In
16	AD1	Address Data Bus 1	In
17	AD0	Address Data Bus 0	In
18	AB15	Address Bus 15	In
19	AB14	Address Bus 14	In
20	AB13	Address Bus 13	In
21	ALE	Address Latch Enable	In
22	NWR	Write	In
23	NCE3	Chip Enable 3	Out
24	NRD	Read	In
25	ABO14	Address Bus 14	Out
26	NCAT	Carriage Power Trigger	Out
27	ABO15	Address Bus 15	Out
28	CK15	Clock	NC
29	NRS	Reset Out	Out
30	NCE2	Chip Enable	Out
31	NRT	Reset In	In
32	Vss	Ground	

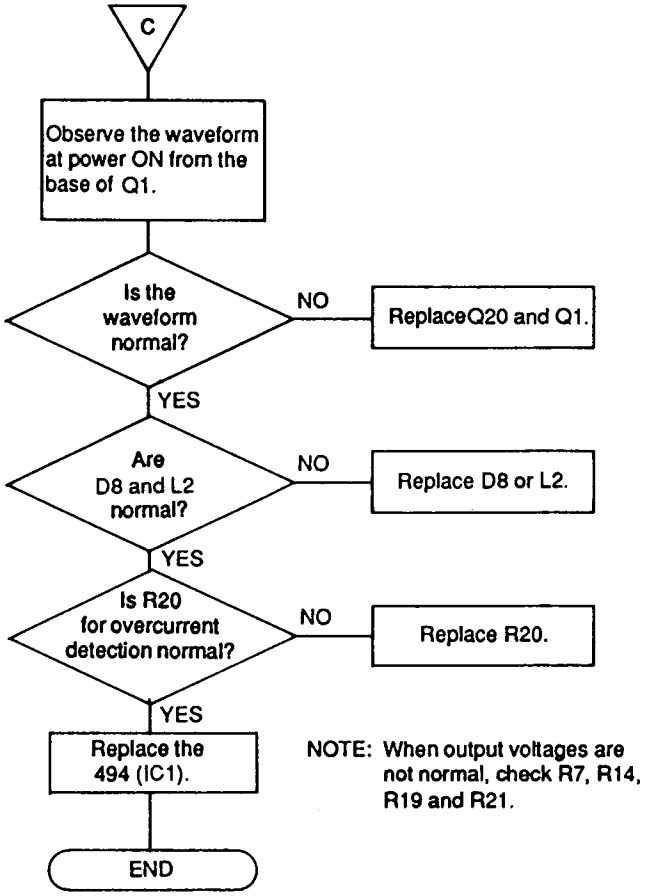
Pin No.	Symbol	Function	In/ Out
33	Vss	Ground	
34	CRA	Carriage Motor A	Out
35	CRB	Carriage Motor B	Out
36	CRD	Carriage Motor D	Out
37	CRC	Carriage Motor C	Out
38	NHDT	Head Power Trigger	Out
39	X1	OSC	
40	X2	OSC	
41	HDTY	Head Power Trigger	Out
42	LFB	Line Feed Motor B	Out
43	LFA	Line Feed Motor A	Out
44	NPR	$\overline{\text{Prime}}$	In
45	NST	Strobe	
46	NBSY	Busy	Out
47	DATA8	Parallel Data 8	In
48	DATA7	Parallel Data 7	In
49	DATA6	Parallel Data 6	In
50	DATA5	Parallel Data 5	In
51	DATA4	Parallel Data 4	In
52	DATA3	Parallel Data 3	In
53	DATA2	Parallel Data 2	In
54	DATA1	Parallel Data1	In
55	HD3	Head Data 3	Out
56	HD1	Head Data1	Out
57	HD5	Head Data 5	Out
58	HD7	Head Data 7	Out
59	HD9	Head Data 9	Out
60	HD2	Head Data 2	Out
61	HD8	Head Data 8	Out
62	HD4	Head Data 4	Out
63	HD6	Head Data 6	Out
64	Vcc	+5V	

8.5 Trouble Shooting Flow Chart

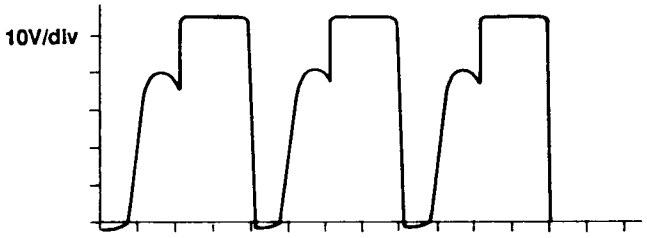



①
Power supply problem
Check AC voltage output at connector CN1.
Is voltage output?
NO
YES
Check resistance values of transformer coils
Do coils open?
YES
Replace the transformer.
NO
Check if fuse or coil on primary board is opened.
Are fuse and coil OK?
NO
Replace the fuse or coil.
YES
END
+30VDC
Which voltage is not output?
+5VDC
Check diode D1~D4.
B
Are D1~D4 normal?
NO
Replace defective Diode.
YES
Observe the waveform at power ON from CT (pin 5), E(pin 10), and Vref (pin 14) of IC1.
Is CT oscillating?
NO
YES
Is the E waveform normal?
NO
YES
Is Vref approx.+5VDC
NO
Replace IC1.
YES
Observe the waveform at power ON from the collector of Q2.
Is the waveform normal?
NO
Replace Q1.
YES
C
1V/div
IC1 ⑤ Voltage Waveform
10µsec/div
5V/div
IC1 ⑩ Voltage Waveform
10µsec/div
10V/div
Q2 Collector Voltage Waveform
10µsec/div

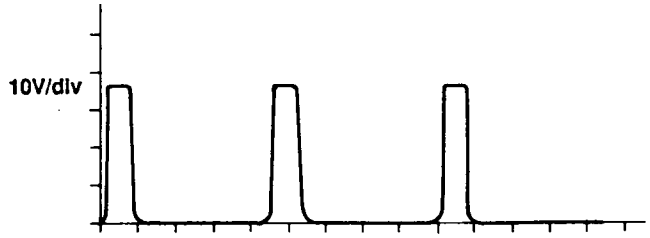




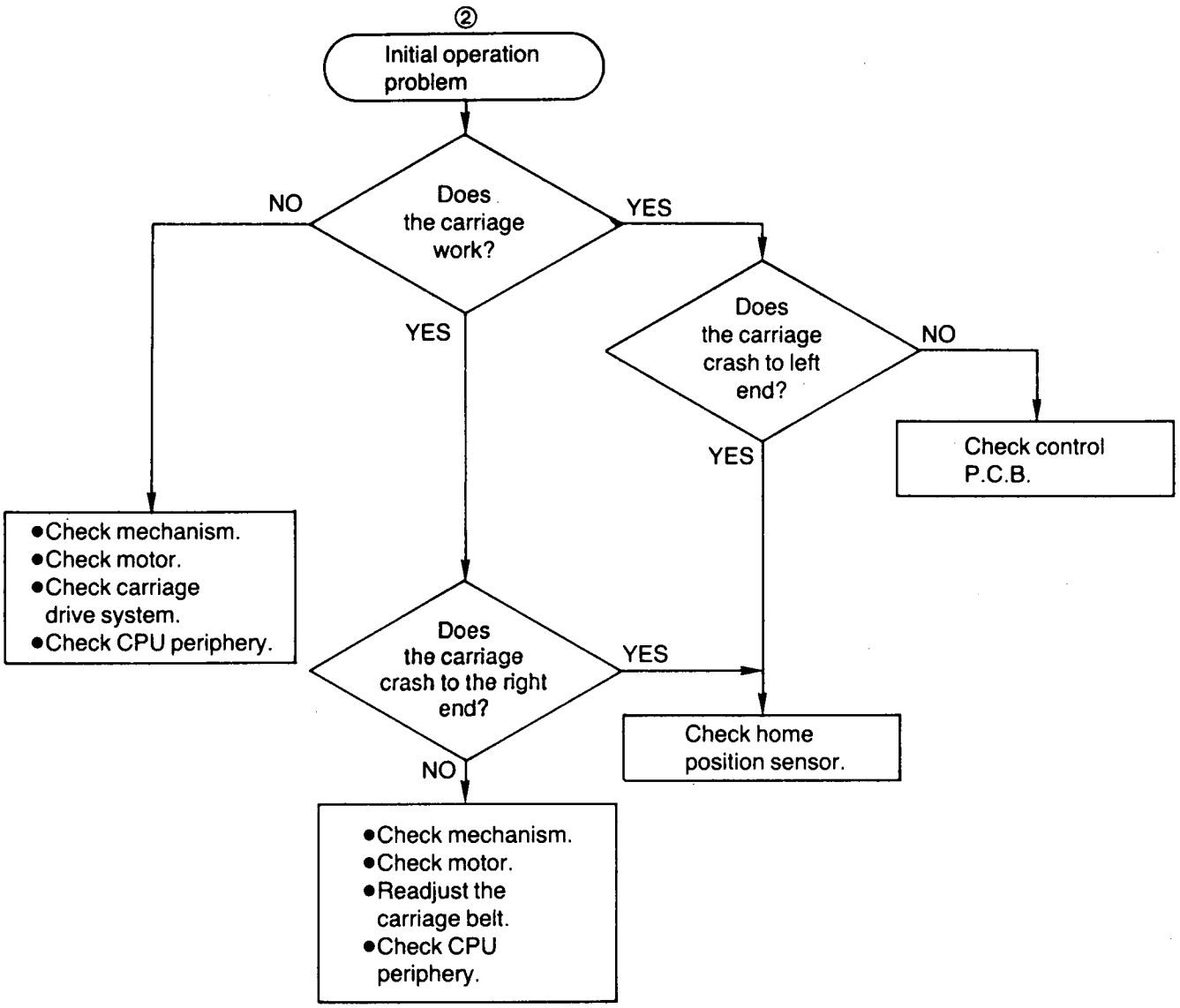
NOTE: When output voltages are not normal, check R7, R14, R19 and R21.

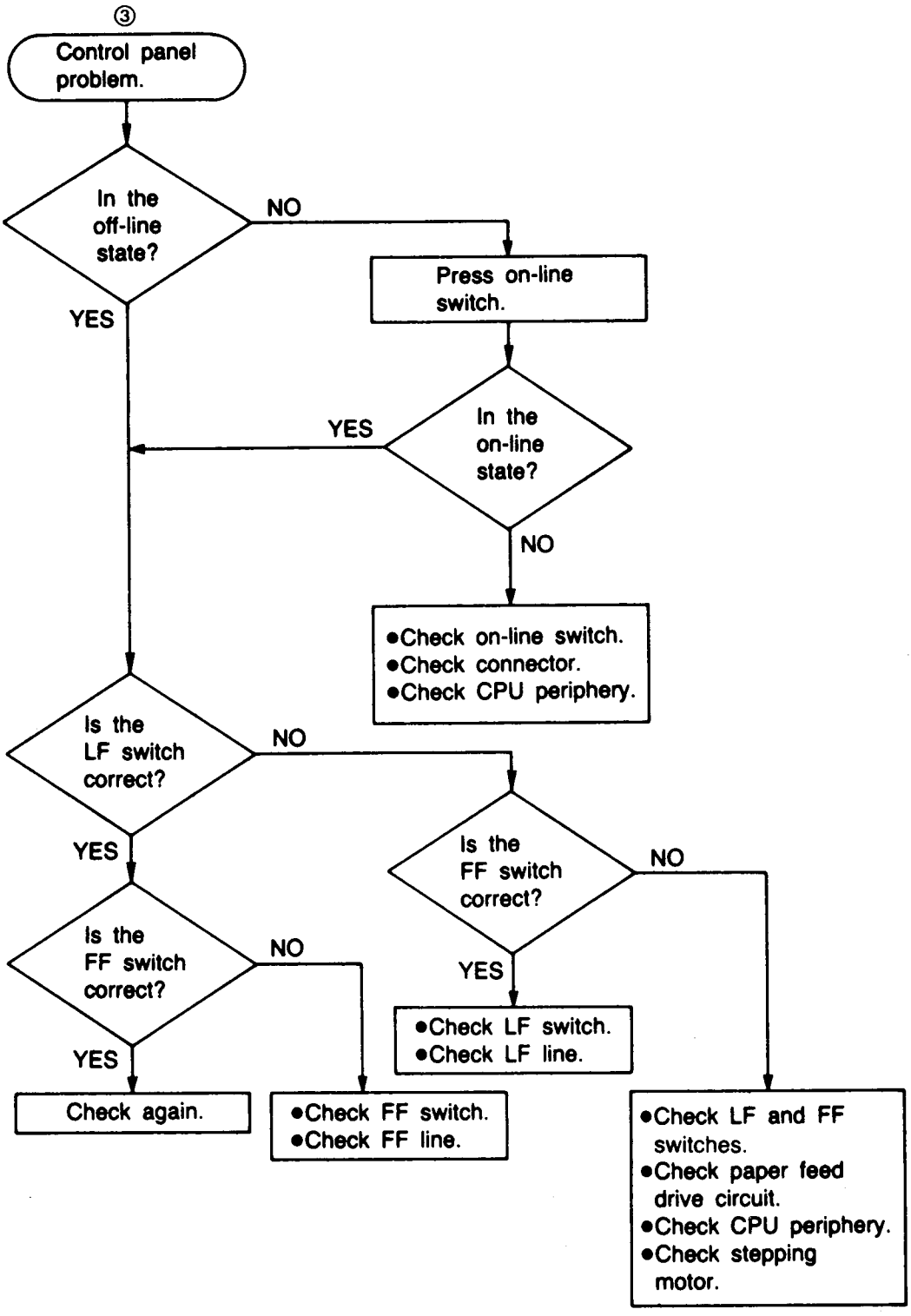


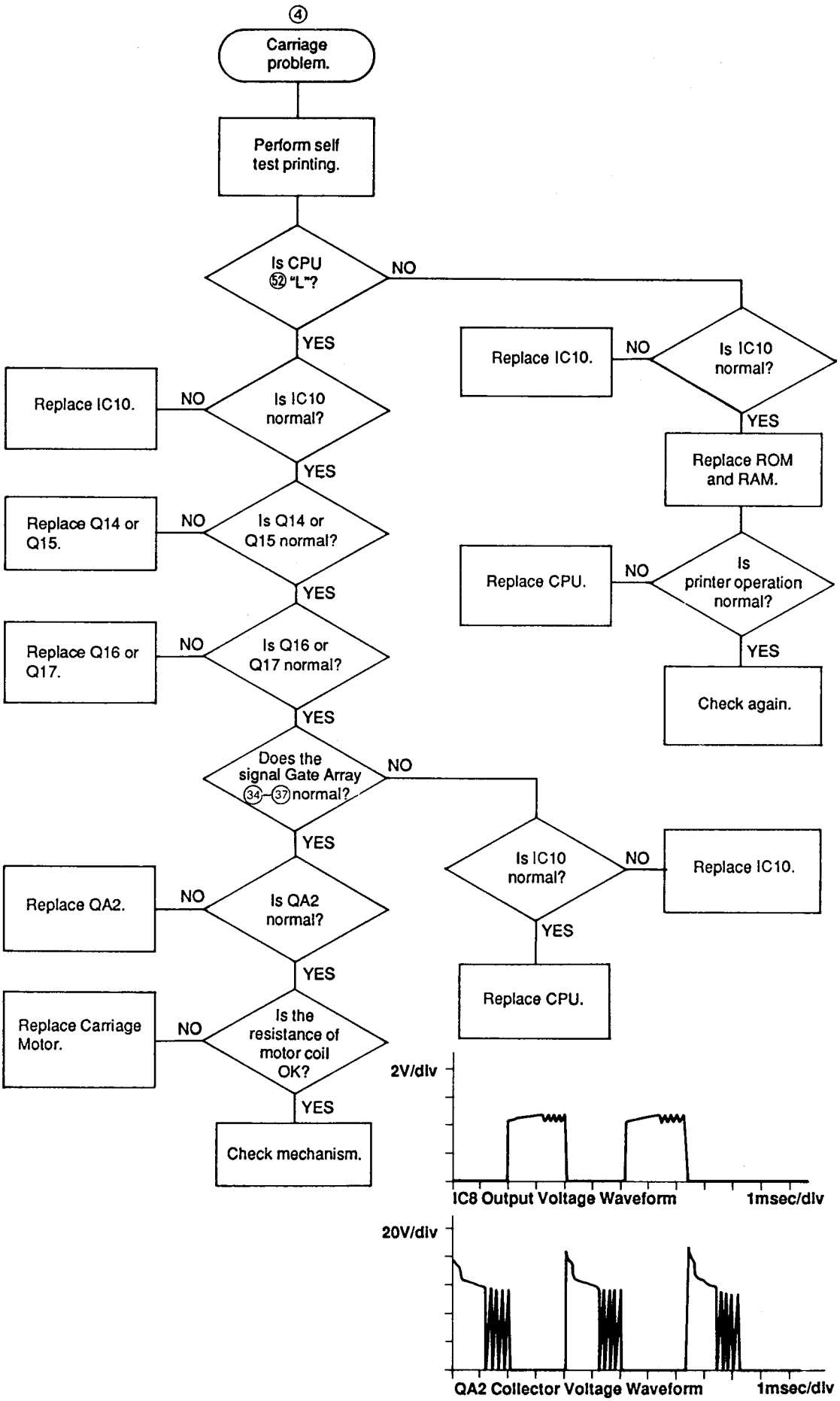
Q20 Collector Voltage Waveform 10µsec/div

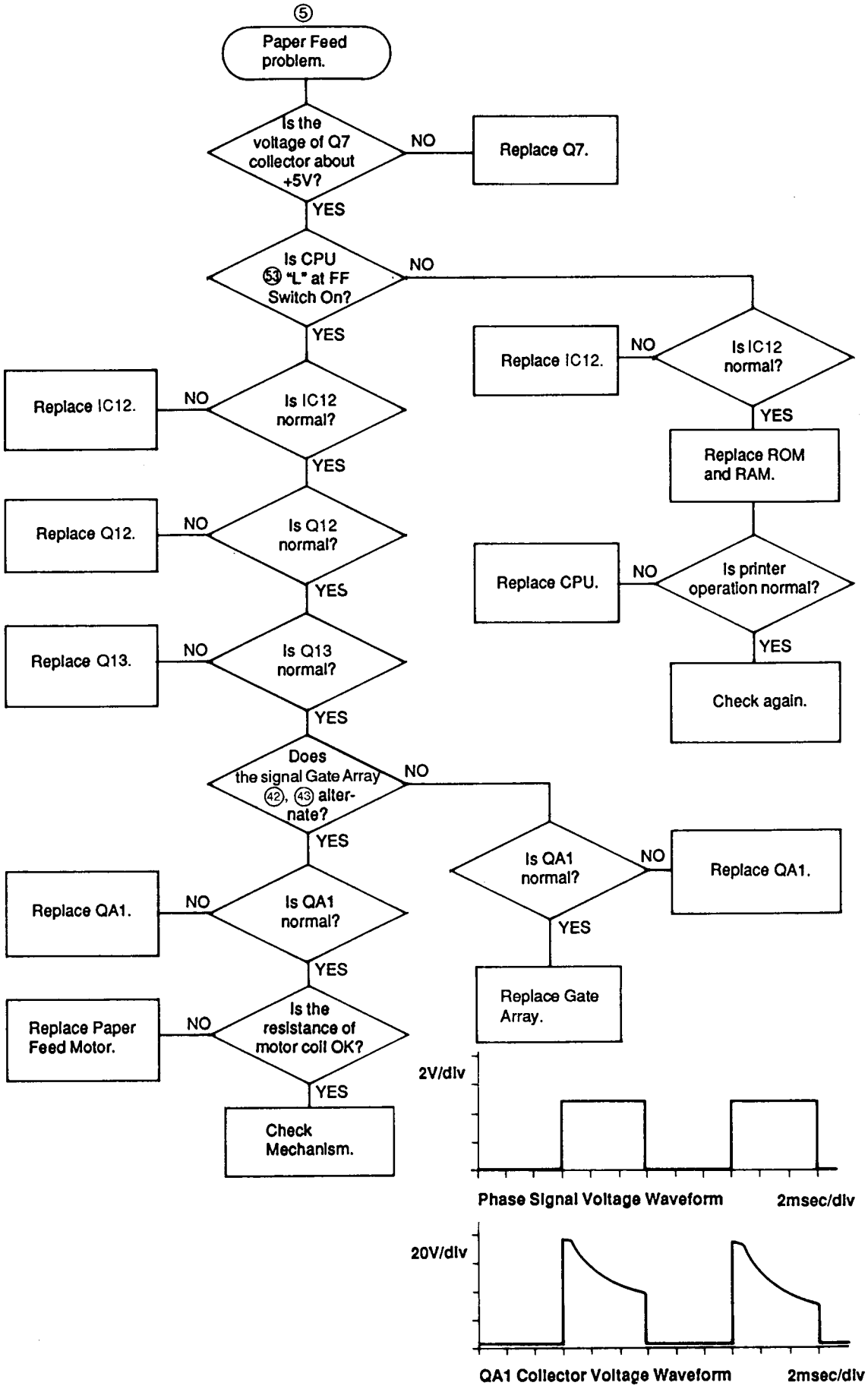


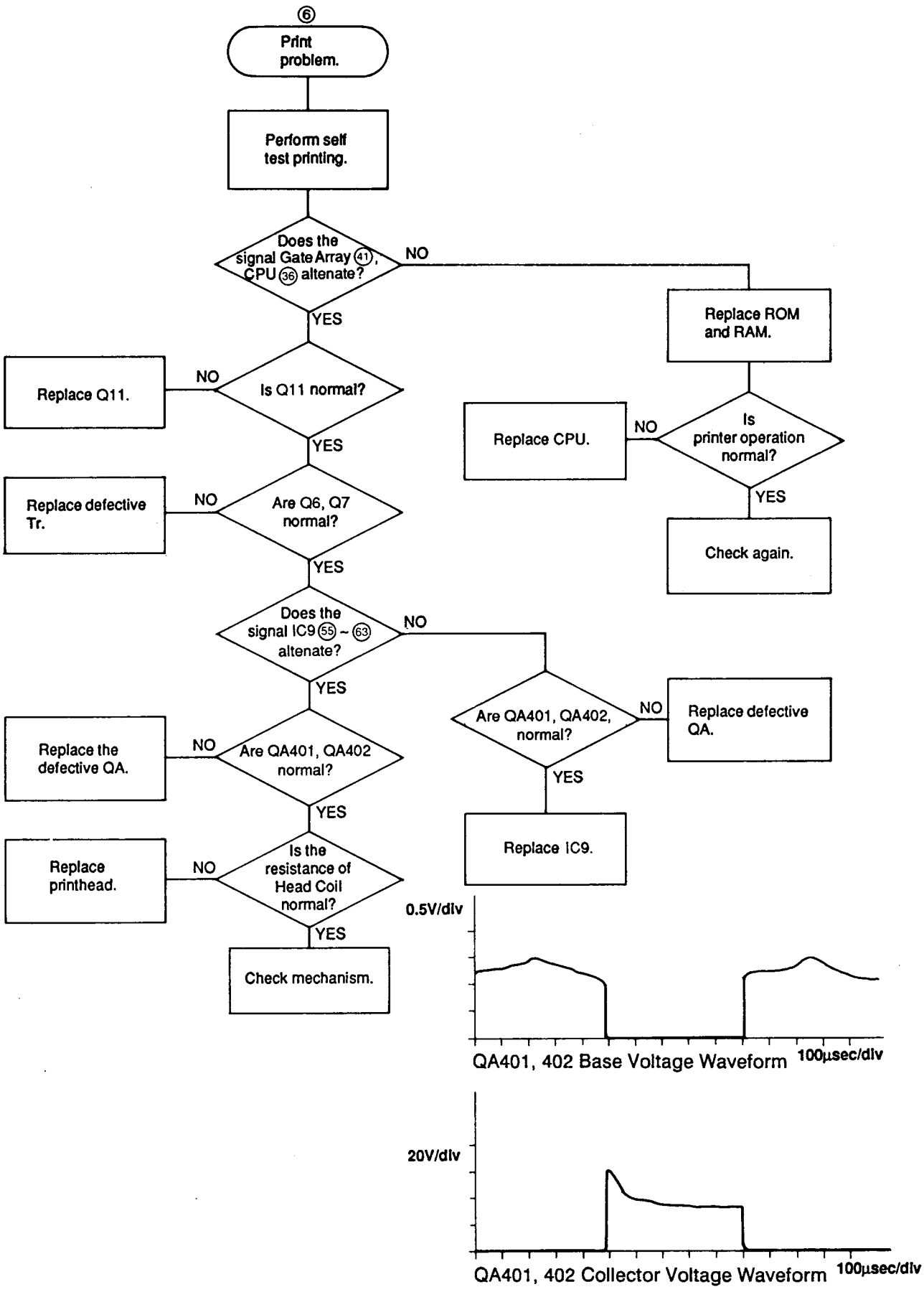
Q3 Collector Voltage Waveform 5µsec/div


②
Initial operation problem
Does the carriage work?
NO
YES
Does the carriage crash to left end?
NO
YES
Check control P.C.B.
●Check mechanism.
●Check motor.
●Check carriage drive system.
●Check CPU periphery.
Does the carriage crash to the right end?
YES
NO
Check home position sensor.
●Check mechanism.
●Check motor.
●Readjust the carriage belt.
●Check CPU periphery.


③
Control panel problem.
In the off-line state?
NO
Press on-line switch.
YES
In the on-line state?
YES
NO
•Check on-line switch.
•Check connector.
•Check CPU periphery.
Is the LF switch correct?
NO
YES
Is the FF switch correct?
NO
Is the FF switch correct?
NO
YES
YES
•Check LF switch.
•Check LF line.
Check again.
•Check FF switch.
•Check FF line.
•Check LF and FF switches.
•Check paper feed drive circuit.
•Check CPU periphery.
•Check stepping motor.

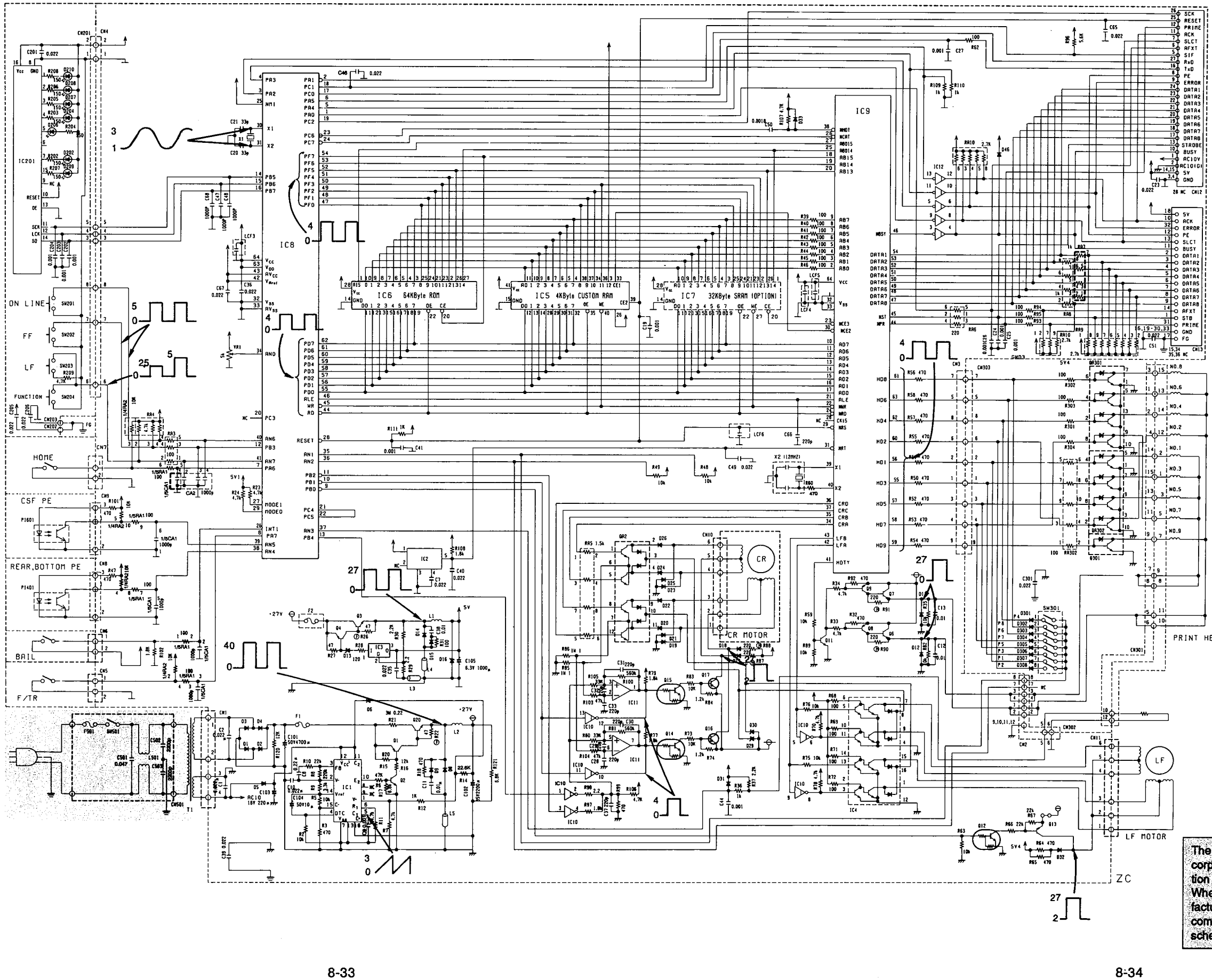

④
Carriage problem.
Perform self test printing.
Is CPU ㊷ "L"?
NO
YES
Replace IC10.
NO
Is IC10 normal?
YES
Replace Q14 or Q15.
NO
Is Q14 or Q15 normal?
YES
Replace Q16 or Q17.
NO
Is Q16 or Q17 normal?
YES
Does the signal Gate Array ㉞–㊲ normal?
NO
YES
Replace QA2.
NO
Is QA2 normal?
YES
Replace Carriage Motor.
NO
Is the resistance of motor coil OK?
YES
Check mechanism.
Replace IC10.
NO
Is IC10 normal?
YES
Replace ROM and RAM.
Replace CPU.
NO
Is printer operation normal?
YES
Check again.
Is IC10 normal?
NO
Replace IC10.
YES
Replace CPU.
2V/div
IC8 Output Voltage Waveform
1msec/div
20V/div
QA2 Collector Voltage Waveform
1msec/div


⑤
Paper Feed problem.
Is the voltage of Q7 collector about +5V?
NO
Replace Q7.
YES
Is CPU ⑬ "L" at FF Switch On?
NO
YES
Replace IC12.
NO
Is IC12 normal?
YES
Replace Q12.
NO
Is Q12 normal?
YES
Replace Q13.
NO
Is Q13 normal?
YES
Does the signal Gate Array ㊷, ㊸ alternate?
NO
YES
Replace QA1.
NO
Is QA1 normal?
YES
Replace Paper Feed Motor.
NO
Is the resistance of motor coil OK?
YES
Check Mechanism.
Replace IC12.
NO
Is IC12 normal?
YES
Replace ROM and RAM.
Replace CPU.
NO
Is printer operation normal?
YES
Check again.
Is QA1 normal?
NO
Replace QA1.
YES
Replace Gate Array.
2V/div
Phase Signal Voltage Waveform
2msec/div
20V/div
QA1 Collector Voltage Waveform
2msec/div


⑥
Print problem.
Perform self test printing.
Does the signal Gate Array (41), CPU (36) altenate?
NO
YES
Replace ROM and RAM.
Is printer operation normal?
NO
YES
Replace CPU.
Check again.
Is Q11 normal?
NO
YES
Replace Q11.
Are Q6, Q7 normal?
NO
YES
Replace defective Tr.
Does the signal IC9 (55) ~ (63) altenate?
NO
YES
Are QA401, QA402, normal?
NO
YES
Replace defective QA.
Replace IC9.
Are QA401, QA402 normal?
NO
YES
Replace the defective QA.
Is the resistance of Head Coil normal?
NO
YES
Replace printhead.
Check mechanism.
0.5V/div
QA401, 402 Base Voltage Waveform
100µsec/div
20V/div
QA401, 402 Collector Voltage Waveform
100µsec/div

8.6 Schematic Diagram

[Main Board]



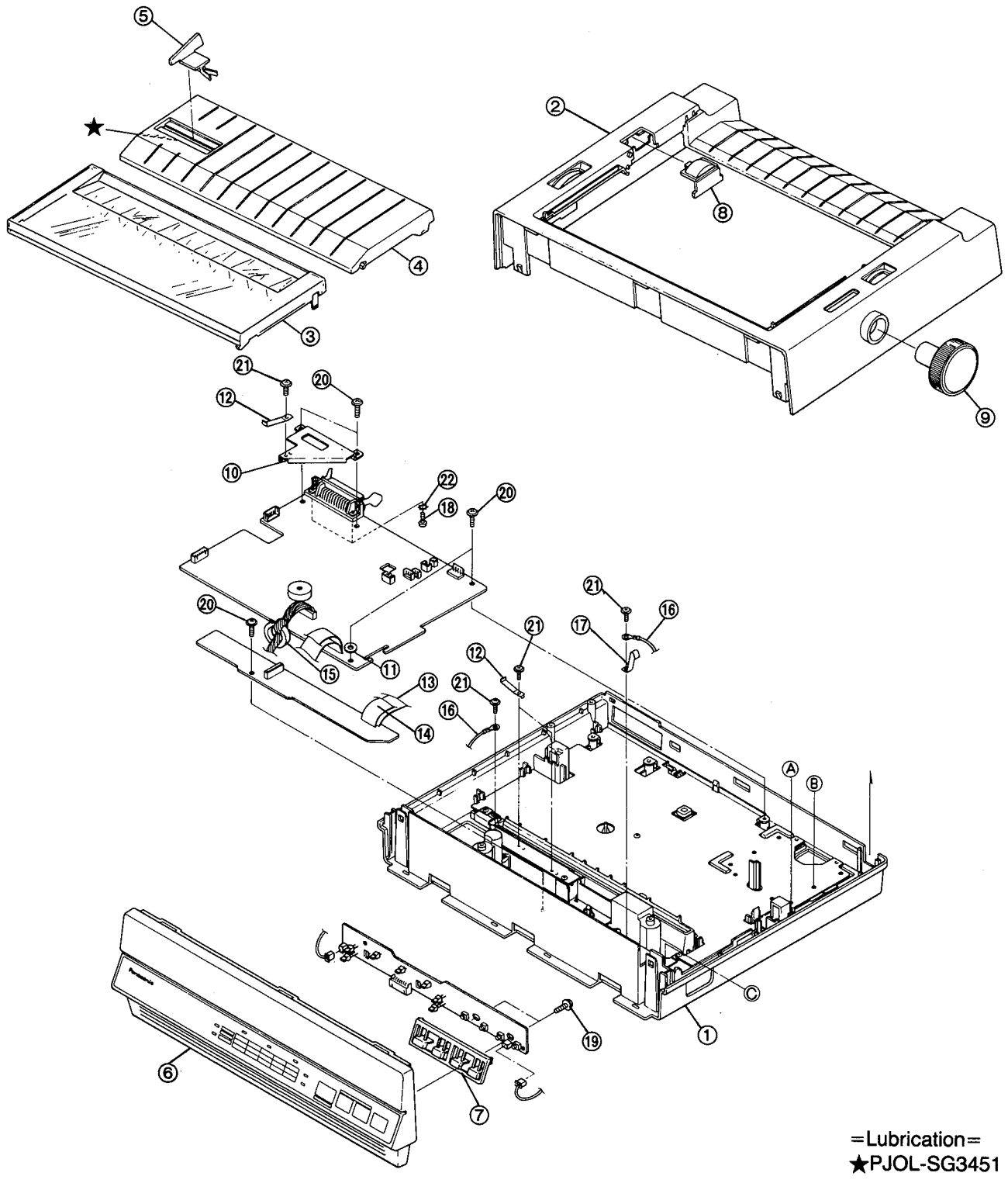
Important safety notice

The shaded area on this schematic diagram incorporates special features important for protection from fire and electrical shock hazards. When servicing it is essential that only manufacturer's specified parts be used for the critical components in the shaded areas of the schematic.

9. Parts List and Lubrication

Notes:
1. Important safety notice.
   Components identified by ⚠ mark have special characteristics important for safety.
   When replacing any of these components, use only manufacturer's specified parts.
2. The S mark is for service standard parts and may differ from production parts.
3. The * mark is available during the production period only.

9.1 Cabinet

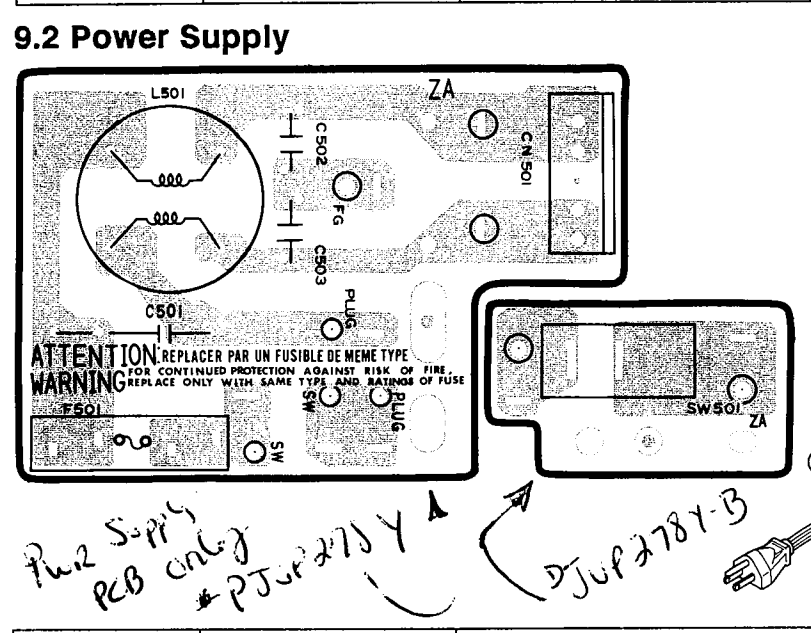


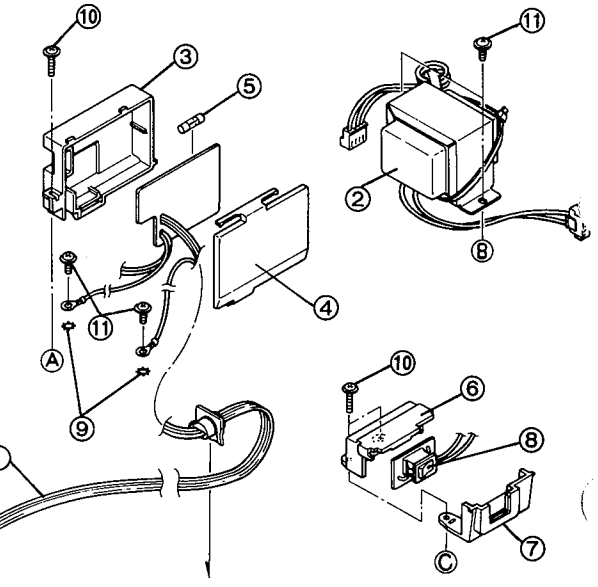
=Lubrication=
★PJOL-SG3451

(Cabinet)

Ref. No.	Parts No.	Parts Name and Description	Per Set	Remarks
1	PJYMP1180M	Lower Cabinet Assembly	1	
2	PJYFP1180M	Upper Cabinet Assembly	1	
3	PJYK2P1180M	Smoked Plastic Cover Assembly	1	
4	PJKK62Z	Top Cover	1	
5	PJUG70Z	Paper Guide	1	
6	PJYK1P1180M	Front Panel Assembly	1	
7	PJHR9162Z	Sheet Switch Spacer	1	
8	PJKE80Z	Gear Cover	1	
9	PJBN25Z	Platen Knob	1	
10	PJMC89Z	Shield Plate	1	
11	PJNW321Z	Washer	1	
12	PJUS3Z	GND Spring	3	
13	PJJE119Z	Flat Cable (Head Relay)	1	
14	PJJE120Z	Flat Cable (Head Relay)	1	
15	PJJN9Z	ES Core	1	
16	PJJT133Z	Ground Wire	2	
17	PJUS101Z	GND Spring	1	
18	XYN3+F10	Screw 3x10mm	2	
19	XTW3+10F	Screw 3x10mm	2	
20	XTW3+8L	Screw 3x8mm	5	
21	XTW3+6L	Screw 3x6mm	5	
22	XWC3B	Washer	2	

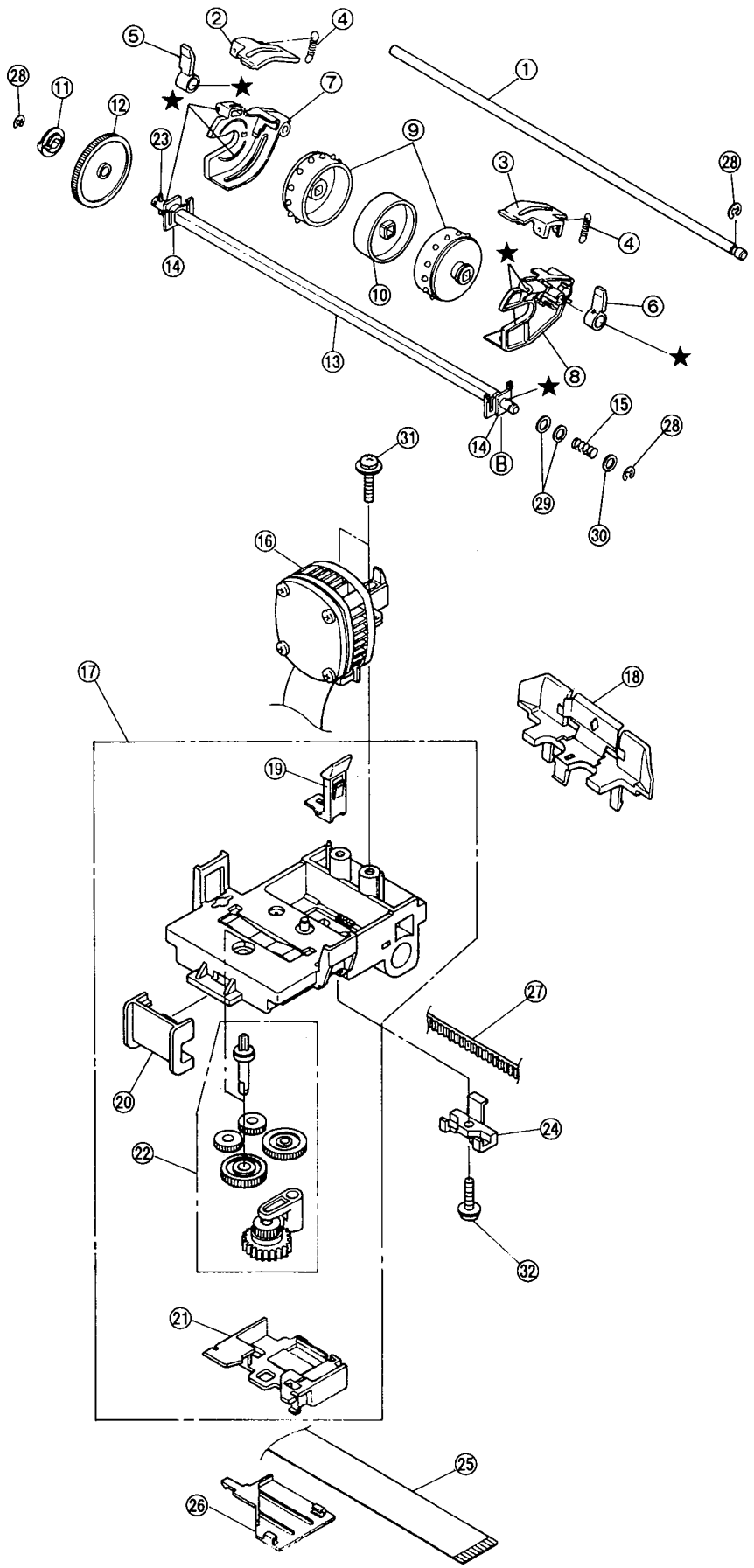
9.2 Power Supply





Ref. No.	Parts No.	Parts Name and Description	Per Set	Remarks
1	PJWAXP1091M	AC Cord Assembly	1	⚠
2	PJWTP1180M	Power Transformer Assembly	1	⚠
3	PJMX48Z	Fuse Enclosure Base	1	⚠
4	PJMX49Z	Fuse Enclosure Cover	1	⚠
5	XBA2C16ND1L	Fuse (F501)	1	⚠
6	PJMX46Z	Enclosure Base	1	⚠
7	PJMX47Z	Switch Enclosure Cover	1	⚠
8	EST2011B	Power Switch (SW501)	1	⚠
9	XWC4B	Washer	2	
10	XTW3+14F	Screw 3x14mm	3	
11	XTW4+8L	Screw 4x8mm	4	
C501	ECQU1A473MH	125V 0.047 Metal	1	⚠
C502, 503	ECKDNS222ME	125V 2200P Ceramic	2	⚠
L501	PJLQS102	Coil	1	⚠
CN501	PJJP111Z	Connector	1	

9.3 Tractor and Carriage



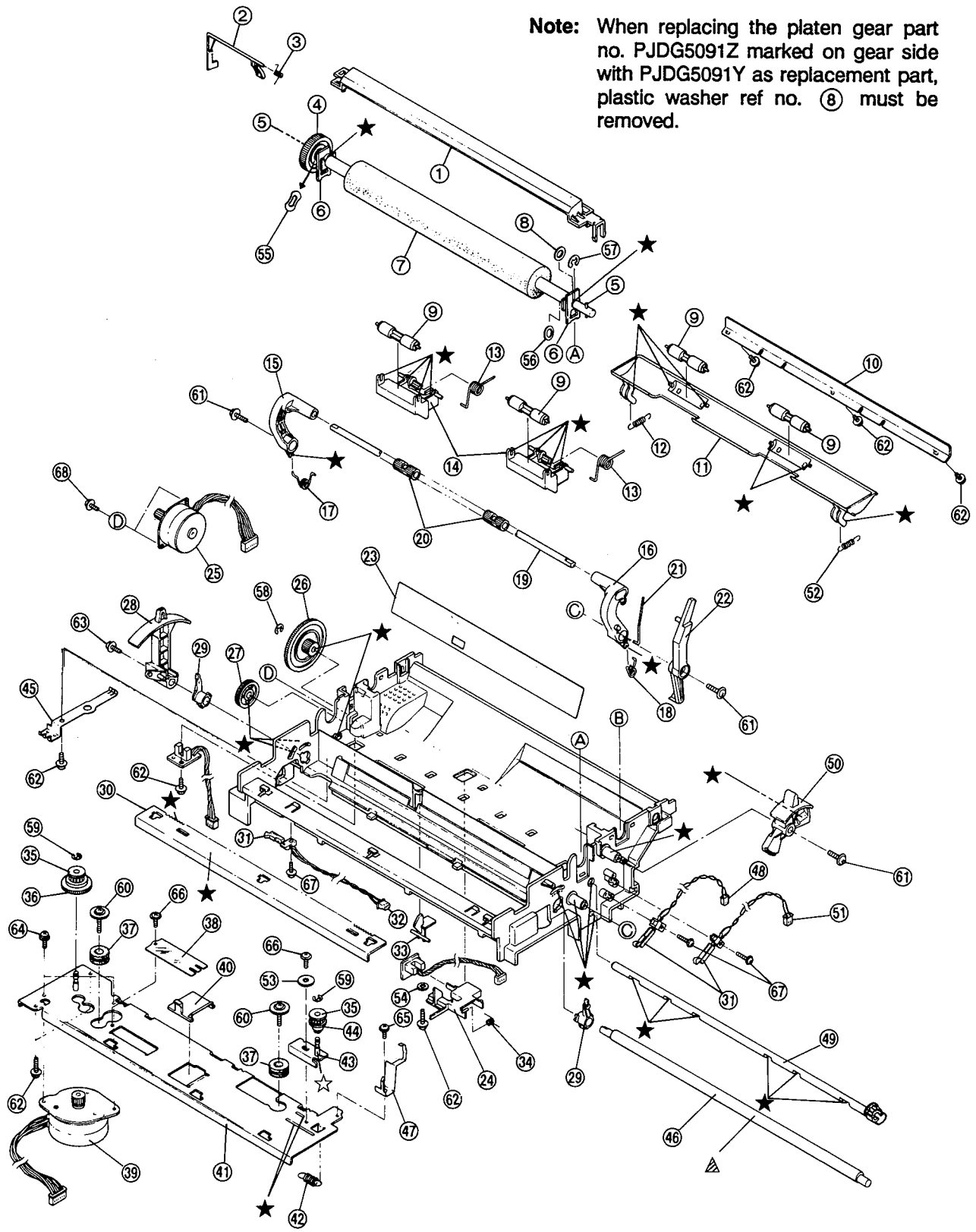
★ PJOL-SG3451

(Tractor and Carriage)

Ref. No.	Parts No.	Parts Name and Description	Per Set	Remarks
1	PJDF340Z	Tractor Guide Shaft	1	
2	PJDT87Z	Tractor Cover (L)	1	
3	PJDT88Z	Tractor Cover (R)	1	
4	PJDS3101Z	Spring	2	
5	PJDT89Z	Lock Lever (L)	1	
6	PJDT90Z	Lock Lever (R)	1	
7	PJDT85Z	Tractor Base (L)	1	
8	PJDT86Z	Tractor Base (R)	1	
9	PJDT91Z	Pin Wheel	2	
10	PJDT92Z	Paper Support	1	
11	PJDG5096Z	Clutch Gear	1	
12	PJDG5095Z	Tractor Gear	1	
13	PJDF339Z	Tractor Drive Shaft	1	
14	PJDJ06079RZ	Tractor Bushing	2	
15	PJDS5126Z	Spring	1	
16	PJWHP1180M	Head Assembly	1	
17	PJZCP1180M	Carriage Assembly	1	
18	PJZU3P1180M	Ribbon Mask Assembly	1	
19	PJME15Z	Cassette Lever	1	
20	PJHR9164Z	Rear Side Guide	1	
21	PJME101Z	Ribbon Feed Gear Cover	1	
22	PJZG1P1180M	Gear Kit	1	
23	XPL2A10WVW	Pin	1	
24	PJME103Z	Timing Belt Clamp	1	
25	PJUP279Y	Flat Cable	1	
26	PJME102Z	Cable Clamp	1	
27	PJDV24Z	Timing Belt	1	
28	XUC4FY	E-ring	3	
29	XWE6	Washer	2	
30	XWG6E10	Plastic Washer	1	
31	XYN3 + F8	Screw 3x8mm	2	
32	XTW3 + 10F	Screw 3x10mm	1	

9.4 Chassis

Note: When replacing the platen gear part no. PJDG5091Z marked on gear side with PJDG5091Y as replacement part, plastic washer ref no. ⑧ must be removed.

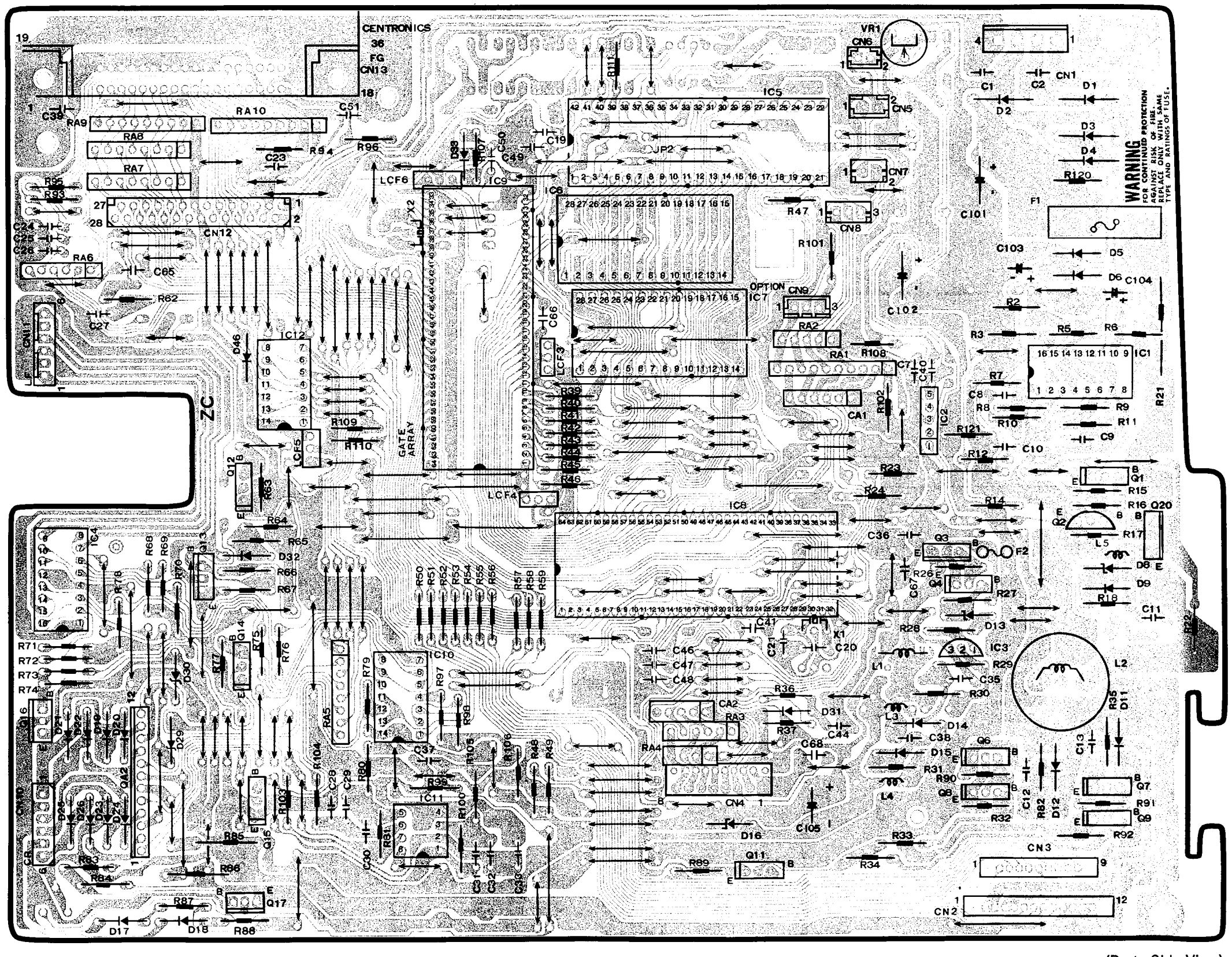


★ PJOL-SG3451
☆ OL-K1879
⍋ OL-G948P

(Chassis)

Ref. No.	Parts No.	Parts Name and Description	Per Set	Remarks
1	PJUG74Z	Paper Separator	1	
2	PJHR9167Z	Paper End Sensor Contact Lever	1	
3	PJDS7026Z	Spring	1	
4	PJDG5091Y	Platen Gear	1	
5	XPL2A14WFP	Pin	2	
6	PJDJ08309RZ	Platen Bushing	2	
7	PJZR1P1180M	Platen Assembly	1	
8	PJNW820Z	Plastic Washer	1	
9	PJDR71Z	Friction Roller	4	
10	PJUL84Z	Guide Support	1	
11	PJZU2P1180M	Paper Guide Assembly	1	
12	PJDS5209Z	Spring	1	
13	PJDS7028Z	Spring	2	
14	PJUR14Z	Roller Holder	2	
15	PJME104Z	Bail Arm (L)	1	
16	PJME105Z	Bail Arm (R)	1	
17	PJDS7022Z	Bail Spring (L)	1	
18	PJDS7023Z	Bail Spring (R)	1	
19	PJDF9123Z	Bail Shaft	1	
20	PJZR2P1180M	Bail Roller Kit	2	
21	PJDS7027Z	Bail Lever Spring	1	
22	PJUB73Z	Bail Lever	1	
23	PJZU1P1180M	Back Tension Sheet Assembly	1	
24	PJHR9165Z	Paper End Sensor Contact Lever	1	
25	PJJQ97Z	Line Feed Motor	1	
26	PJDG5092Z	Middle Gear	1	
27	PJZG2P1180M	Scissors Gear Assembly	1	
28	PJUB72Z	Head Gap Lever	1	
29	PJDG5218Z	Eccentric Cam	2	
30	PJUL83Z	Carriage Guide Plate	1	
31	PJSH1A27Z	Leaf Switch	3	
32	PJJS507Z	Connector with Cable (Home Switch)	1	
33	PJHR9166Z	Paper End Contact Lever	1	
34	PJDS7025Z	Spring	1	
35	PJDG0906Z	Pulley Frange	2	
36	PJDG9030Z	Drive Gear	1	
37	PJHG328Y	Mount Rubber	2	
38	PJUV57Z	Dip Switch Cover	1	
39	PJJQ92Z	Carriage Motor	1	
40	PJUV56Z	Head Cable Cover	1	
41	PJZKP1180M	Carriage Motor Base Assembly	1	
42	PJDS5055Z	Bracket Spring	1	
43	PJZHP1180M	Idle Pulley Bracket Assembly	1	
44	PJDD4134Z	Idle Pulley	1	
45	PJMC90Z	Motor GND	1	
46	PJDF556Z	Carriage Shaft	1	
47	PJUS97Z	Shaft GND	1	
48	PJJS491Z	Connector with Cable (Bail Switch)	1	
49	PJDF9125Z	Friction Cam Shaft	1	
50	PJUB74Z	Paper Feed Selector	1	
51	PJJS506Z	Connector with Cable(Friction/Tractor Switch)	1	
52	PJDS5208Z	Spring	1	
53	XWG3F13	Washer	1	
54	XWG3E12	Washer	1	
55	PJHE6019Z	Washer	1	
56	XWG8A19WW	Washer	1	
57	XUC7FY	E-ring	1	
58	XUC4FY	E-ring	1	
59	XUC3FY	E-ring	2	
60	PJYC3＋MC16	Screw 3x16mm	2	
61	XTW3＋10F	Screw 3x10mm	3	
62	XTW3＋8F	Screw 3x8mm	8	
63	XYN3＋F8	Screw 3x8mm	1	
64	XYN3＋F6	Screw 3x6mm	2	
65	XTW3＋6L	Screw 3x6mm	1	
66	XTW3＋U6L	Screw 3x6mm	2	
67	XTW26＋10F	Screw 2.6x10mm	3	
68	XYN26＋F8	Screw 2.6x8mm	2	

9.5 Main Board



(Parts Side View)

Ref. No.	Parts No.	Parts Name and Description	Per Set	Remarks
Integrated Circuits, Transistors and Diodes				
IC1	PJVIC494C	IC	1	
IC2	PJVIM51953B	IC	1	
IC3	PJVINJM78L05	IC	1	
IC4	PJVIM5266P	IC	1	
IC5	PJVIM6364MA	IC	1	
IC6	PJWIP1180M	IC ROM	1	
IC8	PJVID7810HCW	IC	1	
IC9	PJVID656288	IC	1	
IC10,12	PJVIM74LS05P	IC	2	
IC11	PJVIC393C	IC	1	
D1-4	PJVDRL253	Diode	4	
D5,9,11,12	PJVDMPG06D	Diode	4	
D6,31,33,46	MA150	Diode	4	
D8	PJVDHRP32	Diode	1	
D13	MA2091	Diode	1	
D14	PJVDHRP100	Diode	1	
D15,17-26,32	PJVDMPG06D	Diode	12	
D16	MA2068	Diode	1	
D29,30	MA2360	Diode	2	
Q1	2SB910M	Transistor	1	
Q2	2SC1627	Transistor	1	
Q3	2SD1762	Transistor	1	
Q4	2SA937M	Transistor	1	
Q6,7	2SD1723T	Transistor	2	
Q8,9	2SB642R	Transistor	2	
Q11	2SD637R	Transistor	1	
Q12,14,15	PJVIDTC114Y	Transistor	3	
Q13,16,17	2SB794K	Transistor	3	
Q20	2SC3540	Transistor	1	

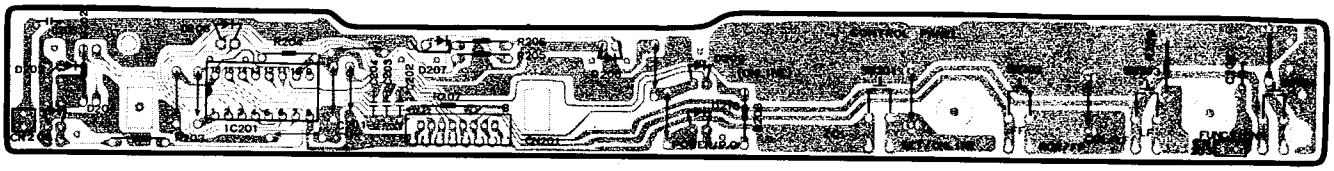
Ref. No.	Parts No.	Parts Name and Description			Per Set	Remarks
Resistors						
R2	ERD25FJ103	10K	1/4W	Carbon	1	S
R3	ERD25FJ471	470	1/4W	Carbon	1	S
R5	ERD25FJ103	10K	1/4W	Carbon	1	S
R6	ERD25FJ473	47K	1/4W	Carbon	1	S
R7	ERO25TKF4701	4.7K	1/4W	Metal	1	
R8	ERD25FJ224	220K	1/4W	Carbon	1	S
R9	ERD25FJ332	3.3K	1/4W	Carbon	1	S
R10	ERD25FJ223	22K	1/4W	Carbon	1	S
R11	ERD25FJ472	4.7K	1/4W	Carbon	1	S
R12	ERO25TKF1001	1K	1/4W	Metal	1	
R14	ERO25TKF2262	22.6K	1/4W	Metal	1	
R15	ERD25FJ821	820	1/4W	Carbon	1	S
R16	ERD25FJ123	12K	1/4W	Carbon	1	S
R17	ERD25FJ682	6.8K	1/4W	Carbon	1	S
R18	ERD25FJ471	470	1/4W	Carbon	1	S
R21	ERX3SJR22C	0.22	3W	Metal	1	
R22,26	ERD2FCG470	47	1/4W	Carbon	2	
R23,24	ERD25FJ472	4.7K	1/4W	Carbon	2	S
R27	ERD25FJ470	47	1/4W	Carbon	1	S
R28	ERD25FJ121	120	1/4W	Carbon	1	S
R29	ERD25FJ2R2	2.2	1/4W	Carbon	1	S
R30,37	ERD25FJ222	2.2K	1/4W	Carbon	2	S
R31	ERD25FJ101	100	1/4W	Carbon	1	S
R32	ERD25FJ471	470	1/4W	Carbon	1	S
R33,34	ERD25FJ472	4.7K	1/4W	Carbon	2	S
R35	ERD25FJ103	10K	1/4W	Carbon	1	S
R36	ERD25FJ102	1K	1/4W	Carbon	1	S
R39-46	ERD25FJ101	100	1/4W	Carbon	8	S
R47	ERD25FJ471	470	1/4W	Carbon	1	S
R48,49	ERD25FJ103	10K	1/4W	Carbon	2	S
R50-58,60	ERD25FJ471	470	1/4W	Carbon	10	S
R59	ERD25FJ103	10K	1/4W	Carbon	1	S

Ref. No.	Parts No.	Parts Name and Description			Per Set	Remarks
R62	ERD25FJ101	100	1/4W	Carbon	1	S
R63	ERD25FJ103	10K	1/4W	Carbon	1	S
R64,65	ERD25FJ471	470	1/4W	Carbon	2	S
R66,67	ERD25FJ223	22K	1/4W	Carbon	2	S
R68,69	ERD25FJ101	100	1/4W	Carbon	2	S
R70,78	ERD25FJ472	4.7K	1/4W	Carbon	2	S
R71,72	ERD25FJ101	100	1/4W	Carbon	2	S
R73,83	ERD25FJ103	10K	1/4W	Carbon	2	S
R74	ERD25FJ122	1.2K	1/4W	Carbon	1	S
R75,76	ERD25FJ103	10K	1/4W	Carbon	2	S
R77,79	ERD25FJ182	1.8K	1/4W	Carbon	2	S
R80,105	ERD25FJ333	33K	1/4W	Carbon	2	S
R81	ERD25FJ564	560K	1/4W	Carbon	1	S
R82	ERD25FJ103	10K	1/4W	Carbon	1	S
R84	ERD25FJ122	1.2K	1/4W	Carbon	1	S
R85,86	ERX1SJ1RO	1	1W	Metal	2	
R87,88	ERD25FJ221	220	1/4W	Carbon	2	S
R89	ERD25FJ103	10K	1/4W	Carbon	1	S
R90,91	ERD25FJ221	220	1/4W	Carbon	2	S
R92	ERD25FJ471	470	1/4W	Carbon	1	S
R93-95	ERD25FJ101	100	1/4W	Carbon	3	S
R96	ERD25FJ562	5.6K	1/4W	Carbon	1	S
R97	ERD25FJ182	1.8K	1/4W	Carbon	1	S
R98	ERD25FJ2R2	2.2	1/4W	Carbon	1	S
R99,101	ERD25FJ471	470	1/4W	Carbon	2	S
R100	ERD25FJ564	560K	1/4W	Carbon	1	S
R102,108	ERD25FJ182	1.8K	1/4W	Carbon	2	S
R103,104	ERD25FJ473	47K	1/4W	Carbon	2	S
R106,107	ERD25FJ472	4.7K	1/4W	Carbon	2	S
R109-111	ERD25FJ102	1K	1/4W	Carbon	3	S
R120	ERD25FJ123	12K	1/4W	Carbon	1	S
R121	ERD25FJ682	6.8K	1/4W	Carbon	1	S

Ref. No.	Parts No.				Per Set	Remarks
Capacitors						
C1,2	ECFD1H223ZF	50V	0.022	Semi-Conductor	2	S
C7	ECFD1H223ZF	50V	0.022	Semi-Conductor	1	S
C8	ECQV1H224JZ	63V	0.22	Polyester	1	
C9	ECFD1H102ZF	50V	1000P	Semi-Conductor	1	S
C10	ECFD1H223ZF	50V	0.022	Semi-Conductor	1	S
C11-13	ECFD1H103ZF	50V	0.01	Semi-Conductor	3	S
C19	ECKD1H102KB	50V	1000P	Ceramic	1	S
C20,21	ECCT1H330KC	50V	33P	Ceramic	2	
C23	ECFD1H223ZF	50V	0.022	Semi-Conductor	1	S
C24-27	ECKD1H102KB	50V	1000P	Ceramic	4	S
C28-33,66	ECKD1H221KB	50V	220P	Ceramic	7	S
C35,36	ECFD1H223ZF	50V	0.022	Semi-Conductor	2	S
C37	ECKD1H221KB	50V	220P	Ceramic	1	S
C38	ECFD1H103ZF	50V	0.01	Semi-Conductor	1	S
C39,40,46	ECFD1H223ZF	50V	0.022	Semi-Conductor	3	S
C41	ECKD1H102KB	50V	1000P	Ceramic	1	S
C44	ECKD1H102KB	50V	1000P	Ceramic	1	S
C47,48,68	ECKD1H102KB	50V	1000P	Ceramic	3	S
C49,51	ECFD1H223ZF	50V	0.022	Semi-Conductor	2	S
C50	ECKD1H182KB	50V	1800P	Ceramic	1	S
C65,67	ECFD1H223ZF	50V	0.022	Semi-Conductor	2	S
C101	ECET50S472	50V	4700	Electrolytic	1	
C102	ECEA1VU222	35V	2200	Electrolytic	1	
C103	ECEA1CU221	16V	220	Electrolytic	1	
C104	ECEA1HU100	50V	10	Electrolytic	1	
C105	ECEA0JU102	6.3V	1000	Electrolytic	1	
LCF3,4,5	EXCECT223ZV	25V	0.022	3 Lead Ceramic Capacitor	3	

Ref. No.	Parts No.	Parts Name and Description	Per Set	Remarks
		Component Combinations		
RA1	EXBT45101J	R-Array	1	
RA2	EXBP84103J	R-Array	1	
RA3	EXBT43101J	R-Array	1	
RA4	EXBP83472J	R-Array	1	
RA5	EXBT44152J	R-Array	1	
RA6	EXBT43221J	R-Array	1	
RA7,8	EXBT44102J	R-Array	2	
RA9,10	EXBP88272J	R-Array	2	
QA2	PJVIFT5763M	Transistor Array	1	
CA1	EXFP5101MW	C-Array	1	
CA2	EXFP4101MBW	C-Array	1	
		Other Parts		
CN1	PJJP81Z	Connector, Power Transformer	1	
CN2	PJJP246Z	Head Relay Cable Holder	1	
CN3	PJJP247Z	Head Relay Cable Holder	1	
CN4	PJJS487Z	Connector, Control Panel	1	
CN5	PJJP37Z	Connector, Bail	1	
CN6	PJJP168Z	Connector, Friction / Tractor	1	
CN7	PJJP157Z	Connector, Home Switch	1	
CN8	PJJP158Z	Connector, Rear/Bottom Paper End Sensor	1	
CN9	PJJP147Z	Connector, CSF Paper End Sensor	1	
CN10	PJJP40Z	Connector, Carriage Motor	1	
CN11	PJJP160Z	Connector, Paper Feed Motor	1	
CN12	PJJS460Z	Connector, Option	1	
CN13	PJJS29Y	Connector, Centronics	1	
F1	XBA2C30ND1L	Fuse	1	⚠
F2	XBAICPF50	IC Protector	1	
L1	PJLQ11Z	Coil	1	
L2	PJLQ16Z	Coil	1	
L3,4,5	EXCELDR35C	Coil	3	
PB1	PJWP1P1180M	Main Board Complete(with Head Relay Terminal Board)	1	*
VR1	PJVV53B02	5K VR	1	
X1	PJVCSA15MX	X'Tal	1	
X2	PJVCST12MT	X'Tal	1	
LCF6	EXC-EMT103D	16V 0.01 EMI Filter	1	

9.6 Control Panel

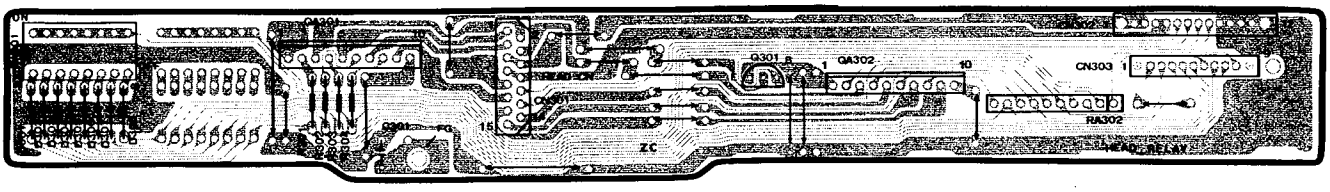


(Parts Side View)

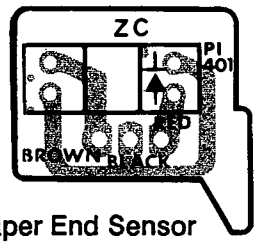
(Control Panel)

Ref. No.	Parts No.	Parts Name and Description	Per Set	Remarks
C201,205,206	ECFD1H223ZF	50V 0.022 Semi-Conductor	3	S
C202,203,204	ECKD1H102KB	50V 1000P Ceramic	3	S
CN201	PJJP233Z	Connector	1	
CN202,203	PJJP43Z	Connector	2	
D202,204	PJVDTLG208	LED (Green)	2	
D206-209	PJVDTLG208	LED (Green)	4	
D210	PJVDTLR208	LED (Red)	1	
IC201	PJVIM66312P	IC	1	
R202-208	ERD25FJ151	150 1/4W Carbon	7	S
R209	ERD25FJ472	4.7K 1/4W Carbon	1	S
SW201-204	EVQQS205K	Switch	4	
PB2	PJWP2P1180M	Control Board Complete	1	*
1	PJHR9159Z	LED Holder	3	
2	PJHR9160Z	LED Holder	2	

9.7 Sensors and Head Relay Terminal

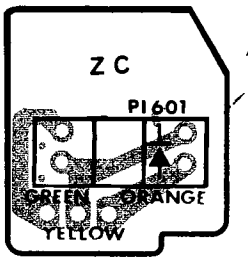


Head Relay Terminal



CSF Paper End Sensor

(Parts Side View)



PJVP243Z-E

Bottom/Rear Paper End Sensor

Ref. No.	Parts No.	Parts Name and Description	Per Set	Remarks
C301	ECFD1H223ZF	50V 0.022 Semi-Conductor	1	S
CN301	PJJS422Z	Connector	1	
CN302	PJJP246Z	Head Relay Cable Holder	1	
CN303	PJJP247Z	Head Relay Cable Holder	1	
CN401	PJJS489Z	Connector with Cable (CSF P/E Sensor)	1	
CN601	PJJS490Z	Connector with Cable (Bottom P/E Sensor)	1	
D301-308	MA150	Diode	8	
Q301	2SD2088	Transistor	1	
QA301,302	PU4123KU	Transistor Array	2	
R301-304	ERD25FJ101	100 1/4W Carbon	4	S
RA302	EXBT45101J	R-Array	1	
SW301	PJSSX014Z	Switch	1	
PB3	PJWP3P1180M	Head Relay Terminal Board Assembly	1	*
PI401,601	PJVDTLP806	Photo Sensor	2	
Packing Materials				
P1	PJQX5725Z	Instruction Book	1	
P2	PJPG560Z	Carton Box	1	
P3	PJPN303Z	Pad (L)	1	
P4	PJPN304Z	Pad (R)	1	
P5	PJPN305Z	Pad (Bottom)	1	